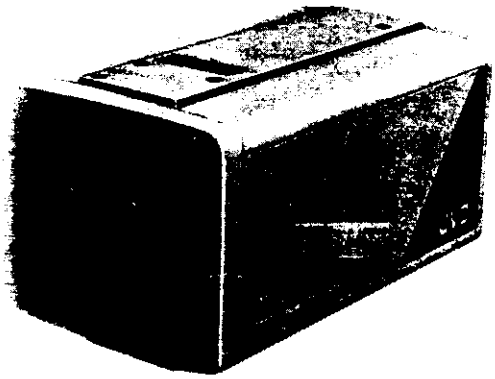
JVC

Chassis V52

SERVICE MANUAL

MODEL TK-870E



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(NOTE) Electrical components having special safety-related characteristics are identified by shading (▬) on the schematic and by (⚠) on the parts list in Service Manual. When replacing these components, be sure to use designated parts.

SPECIFICATIONS

Item	Content	Item	Content
Type	Colour video camera head	Minimum object illumination	20 Lux (F1.4 lens, AGC operational)
Colour system	PAL standard		
Pickup element	2/3" solid-state CCD (Charge Coupled Device)	Recommended object illumination	2,000 Lux
Effective pixels	500H x 582V	White balance setting	Indoor (approx. 3,200K)/Outdoor (approx. 5,500K), switchable
Scanning	625 lines, 2 : 1 interlaced		
Synchronizing system	Internal/external Automatic switching	Lens mount	C-mount
Sync reference signal input	Composite video signal (VBS)/1.0 Vp-p, 75 ohms, terminated (or black burst signal (B.B.)) Connector: BNC	Power requirement	DC 12V (±10%) Ripple voltage: less than 50 mV
		Power consumption	6.7 VA
		Operating temperature range	−5 to +40°C (23 to 104°F)
Sync reference signal output	Composite sync reference signal/approx. 0.3 Vp-p, 75 ohms, unbalanced Socket: D-sub 9-pin	Operating humidity	Less than 90% (without moisture condensation)
Video signal output	Composite video signal/1.0Vp-p, 75 ohms, unbalanced (2 outputs: BNC, connector/D-sub 9-pin socket)	Fuse	QMF51E2 – 1R0S (1A) x 1 QME51E2 – R40S (0.4A) x 1
		Dimensions (W x H x D)	88 x 85 x 158 mm, (3-1/2" x 3-3/8" x 6-1/4"), without dust cap
	R.G.B video signal/0.7 Vp-p, 75 ohms, unbalanced (1 output: D-sub 9-pin socket)	Weight	About 860g (1.9 lbs.), without dust cap
		Provided accessories	Dust cap x 1 Power cord x 1 Iris plug (for iris socket) x 1
Video S/N raito	45 dB		
Resolution	320 TV lines (horizontal)		

** Design and specifications are subject to change without notice.*

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Apr. 198

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2. ADJUSTMENT

3. PARTS LIST

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1. INTRODUCTION AND REPAIR SERVICE

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

CAUTION:
To prevent electric shocks and risk of fire hazards, do NOT use other than the specified power source.

CAUTION:
To reduce the risk of electric shock, do not remove cover (or back). No user-serviceable parts inside. Refer servicing to qualified service personnel.

Thank you for purchasing this JVC colour video camera head.

The TK-870E is a colour video camera head using a single CCD (Charge Coupled Device) solid-state pick-up element.

This camera head is for use in an image processing system (processing system for picture composition, graphics, editing, synthesis, measurement, recognition, analysis etc) shooting such material as images of paintings, photographs, real subjects etc. for processing.

This instruction book is divided into three sections: English, German and French.

CONTENTS

FEATURES

- **Equipped with solid state CCD (Charge Coupled Device) image pickup element**
  Excellent print quality free of afterimages. No image distortion. Shock and vibration resistant.
- **High resolution (horizontal resolution 320 lines)**
  Excellent colour reproduction with RGB primary colour filter system
- **C-mount type lens mount**
  Compatible with the HZ-C611AF(U) video camera lens which features 6:1 power zoom capability, auto-focus and auto iris (optional) as well as any one of several C-mount lenses for use with 2/3" TV camera.
- **Two types of video signal output**
  Composite video signals (2 sets) and RBG signals (1 set) can be output.
- **Easy installation and operation**
  * Screw fittings on both the top and bottom of the unit allow it to be mounted from above or below, depending on installation requirements.
  * Synchronous coupled circuits make this camera adaptable for a wide range of uses.
  * Convenient flange focal distance (distance between lens mount and image forming surface) fine adjustment controls on the outside of the unit.
  * Aluminium body.

PRECAUTIONS

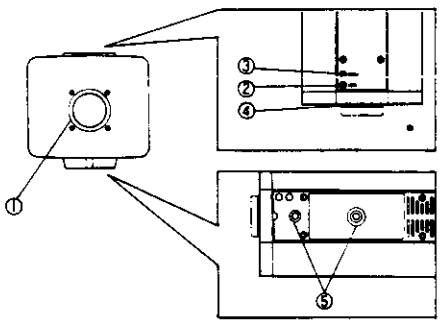
To prevent malfunctions, electric shocks, damage, deformation or degradation, take the following precautions.

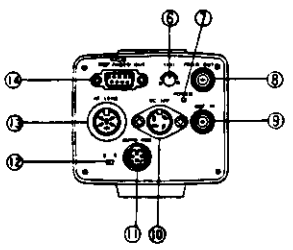
- In case of abnormal operation (smoke, strange sound or odour, etc.), stop using the camera and have it serviced by your nearest dealer.
- Do not aim the camera lens directly at the sun or any other extremely bright object.
- Never disassemble any part of the camera.
- Do not allow flammable objects, metal objects, water or sand to get inside the camera.
- Do not subject the camera to excessive shocks or vibrations.
- Do not expose the camera to rain or moisture.
- Do not use or store the camera:
  * in excessively hot, humid or cold places
  * around oily smoke or steam
  * near heating appliances
  * in dusty places
  * in the proximity of a strong magnetic field or where an electric signal is generated
  * in places with risk of fire
- Do not expose the camera to volatile liquids, and do not allow rubber or vinyl objects to come into contact with the unit for prolonged periods of time.

Cleaning

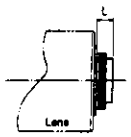
- Do not use benzine or thinner.
- Use a soft cloth to wipe dirt from the body and control panel.
- Only use camera air blower bulbs or lens cleaning paper (sold in camera shops) to clean the lens.

CONTROLS, CONNECTORS AND INDICATORS
(Names of Parts and Functions)





① **Lens mount**
C-mount type lens mount (1" -32UN).
Use the HZ-C811AF(U) (F1.2, f=11—66mm, auto-focus, auto iris control, 6:1 power zoom lens) video camera lens or mount a C-mount lens designed for use with a 2/3-inch CCTV (Closed Circuit TV) camera.
Note:
'L' is the distance between the lens surface and mount surface (see the diagram below). Only lenses where 'L' does not exceed 6.5mm (1/4") can be used.



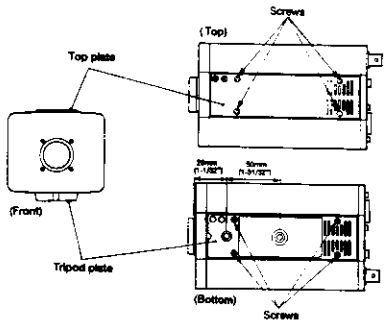
② **Lock screw (LOCK)**
This screw is used to prevent error in the flange focal distance once it has been adjusted.
This screw should be loosened to make the flange focal distance adjustment (by rotating the focus screw), and re-tightened afterwards.

③ **Focus screw (FOCUS)**
This screw is to adjust flange focal distance necessary for correct focusing of each lens.
To adjust the flange focal distance, rotate this screw to optimize the focus.
Before adjusting, release the lock by loosening the lock screw. When finished making the adjustment, tighten the lock screw again.

④ **Dust cap**
When the lens is not mounted on the camera head, cover it with the dust cap to protect the internal parts from dust or damage.
* The dust cap (provided) has been attached to the lens mount when leaving the factory.

⑤ **Camera fixing holes**
Use these holes to fix the camera (1/4" -20UN).
This camera can be mounted either from the top or the bottom using the two fittings on the tripod plate pictured in the diagram on the next page. The tripod plate with mount fittings is attached to the bottom of the unit.

▪ **Movable mounting plate**
Some installation arrangements will require mounting from the top of the camera. To do this, top plate and tripod plate (with mount fittings) have to be switched. (See diagram below.) Both plates are attached to the camera by four screws. Removing these screws will free the plates. Since the size and fittings are identical the tripod plate will mount easily onto the top of the camera. Remount the top plate, then, to the bottom of the camera.



⑥ **TINT control knob (TINT)**
This is used for making fine adjustments to the tint.
Tint is subject to change due to the type of lens used and the colour temperature at the time of shooting.
When shooting a white subject, adjust so that the image on the video monitor is of the same whiteness.

B : Increases the amount of blue
R : Increases the amount of red

Note:
Be sure to use a correctly adjusted video monitor and recheck the white balance switch selector position.

⑦ **Power indicator (POWER)**
The LED lights to indicate that the power is supplied to the camera head.

⑧ **Video signal output connector (VIDEO OUT)**
The video signal is output from this connector (BNC). Connect to the video monitor or recorder.

⑨ **Sync reference signal input connector (REF. IN)**
Use this connector to supply the composite video (VBS) or black burst (B.B.) signal used as the sync reference signal for the gen-lock operation (BNC connector).
When the gen-lock reference signal is input, the synchronization mode of the camera is switched automatically internal to external (gen-lock).
(When operating the camera by internal synchronization, remove this connector)
Note:
Gen-lock is not available if the external sync reference input is below -6 dB of the reference level.
Reference level: VBS = 140 IRE
B.B. = 40 IRE

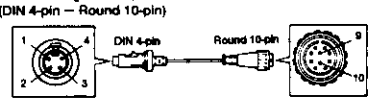
⑩ **DC 12V power supply socket**
When the camera head is to be powered by DC 12V, supply the power via this DIN type 4-pin socket.
Use the AC adaptor AC-C322 or AC-C424 (optional). Connection of this to the camera head is by the power cord provided.
Use a DC 12V power source with a ripple voltage rating of less than 50mV. (Power supply current should exceed 700mA.)

Pin Assignment
▪ Power supply socket (DIN 4-pin)

Pin No.	Signal
1	DC 12V
2	DC 12V
3	Ground
4	Ground

▪ The connection between pins 1 and 2 and that between pins 3 and 4 are both jointed inside.
Make sure that the plug to be connected to this socket has the same configuration.

▪ Power cord (provided)
(DIN 4-pin — Round 10-pin)



Pin No.	Signal
1	DC12V
2	DC12V
3	Ground
4	Ground

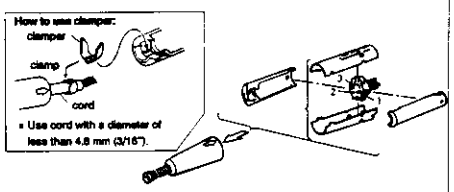
Pin No.	Signal
1—8	——
9	Ground
10	DC12V

⑪ **Auto-iris socket**
When using lenses other than the HZ-C811AF(U) video camera lens, the iris connector for the lens being used is plugged into this socket.
Note:
Use a lens with a current consumption of less than 50mA.

Pin Assignment
▪ Auto-iris socket (3-pin)

Pin No.	Signal
1	Ground
2	Video
3	DC9V (Max. 50mA)

▪ Iris plug (provided) (3-pin)



▪ When there are differences in iris plugs, use the accessory iris plug (3-pin).

⑫ **White balance switch**

☼: **The preset white balance setting for indoor light (approx. 3,200K) is selected.**

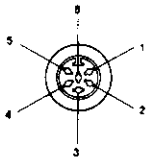
☼: **The preset white balance setting for outdoor light (approx. 5,500K) is selected.**

⑬ **Auto-Focus lens socket (AF LENS)**

This is for connection of the lens plug for the video camera lens HZ-C811AF(U) (F1.2, f=11–66mm, auto-focus, auto iris control, 6:1 power zoom lens).

Pin Assignment

▪ Auto-Focus lens socket (DIN 8-pin)



Pin No.	Signal
1	DC12V
2	Ground
3	DC8V (Max. 50mA)
4	———
5	Iris control DC voltage
6	Ground

⑭ **R/G/B/REF./VIDEO signal output socket (R/G/B/REF./VIDEO OUT)**

This is the output socket for RGB signals, composite sync reference signals and composite video signals (D-Sub 9-pin).

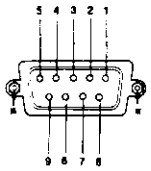
This socket connects necessary signal outputs for image processing to the image processing system input terminal.

Use a connecting cable suitable for connection between the video camera and image processing system sockets or a cable with an impedance of 75 ohms. (The cable should be as short as possible.)

When using a BNC plug for the image processing system input, use the VC-451-2E (cable length: approx. 2m (6.6 feet)) camera cable (optional). For D-sub 9-pin input terminals, use VC-452-2E (cable length: approx. 2m (6.6 feet)) D-sub–D-sub cable (optional).

Pin Assignment

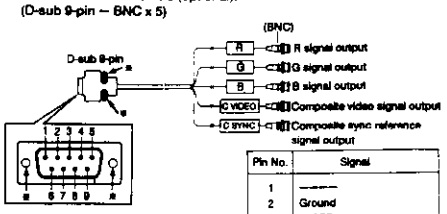
▪ R/G/B/REF./VIDEO signal output socket (D-sub 9-pin)



* Use 2.6mm-diameter screws (millimetric pitch screw) when attaching plug.

Pin No.	Signal
1	Ground
2	Ground
3	R (RED)
4	G (GREEN)
5	B (BLUE)
6	Composite video
7	Composite sync reference
8	Ground
9	Ground

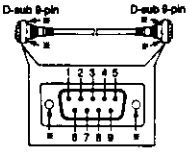
▪ Camera cable VC-451-2E (optional).
(D-sub 9-pin – BNC x 5)



* Use 2.6mm-diameter screws (millimetric pitch screw) when attaching plug.

Pin No.	Signal
1	———
2	Ground
3	R (RED)
4	G (GREEN)
5	B (BLUE)
6	Composite video
7	Composite sync reference
8	Ground
9	Ground

▪ D-sub–D-sub cable VC-452-2E (optional).
(D-sub 9-pin – D-sub 9-pin)



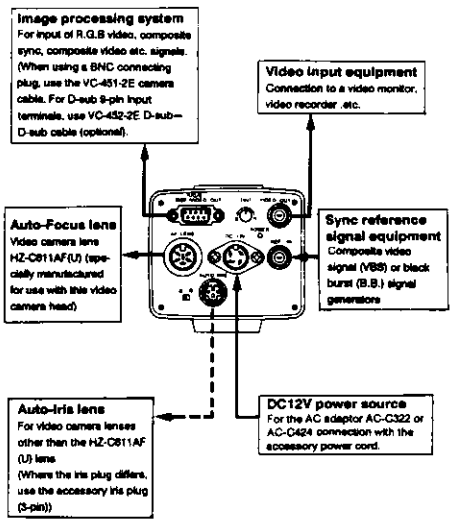
* Use 2.6mm-diameter screws (millimetric pitch screw) when attaching plug.

Pin No.	Signal
1	Ground
2	Ground
3	R (RED)
4	G (GREEN)
5	B (BLUE)
6	Composite video
7	Composite sync reference
8	Ground
9	Ground

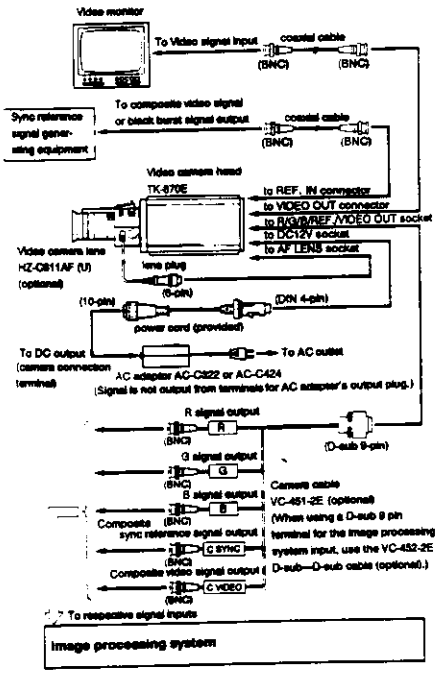
CONNECTIONS

▪ Do not turn power on until connections are completed.
▪ Refer to the instruction manuals of the connected equipment for further information.

〈Connections Layout〉

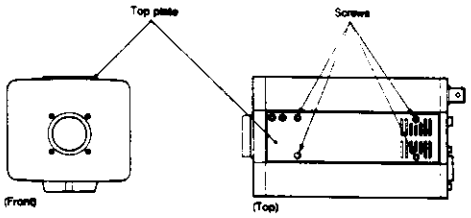


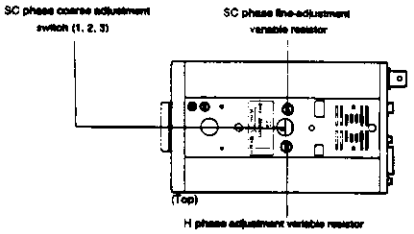
(Basic Connections Layout)



ADJUSTMENTS FOR SYNCHRONIZED CONNECTIONS

In case of synchronized connection, it may be necessary to coordinate the camera video adjustment settings depending on cameras to be used.
After connection, adjust the horizontal phase (H PHASE) and colour subcarrier phase (SC PHASE). (It may not be necessary if there is no synchronized connection. There is no relation between this and R.G.B signals either.)
Remove the top plate (with four screws) and adjust from the adjustment holes under it.





1) **Horizontal phase adjustment (H PHASE)**
Rotate the H phase adjustment variable resistor for optimum horizontal phase.
2) **Colour subcarrier phase adjustment (SC PHASE)**
Change the setting of the SC phase coarse adjustment switch (1, 2, 3) in conjunction with the SC phase fine adjustment variable resistor to obtain maximum monitor colour gain.

* For details, consult your dealer

Note:
Gen-lock operation is not possible using a signal containing several jitters such as video recorder playback signal.

AGC (Automatic Gain Control)

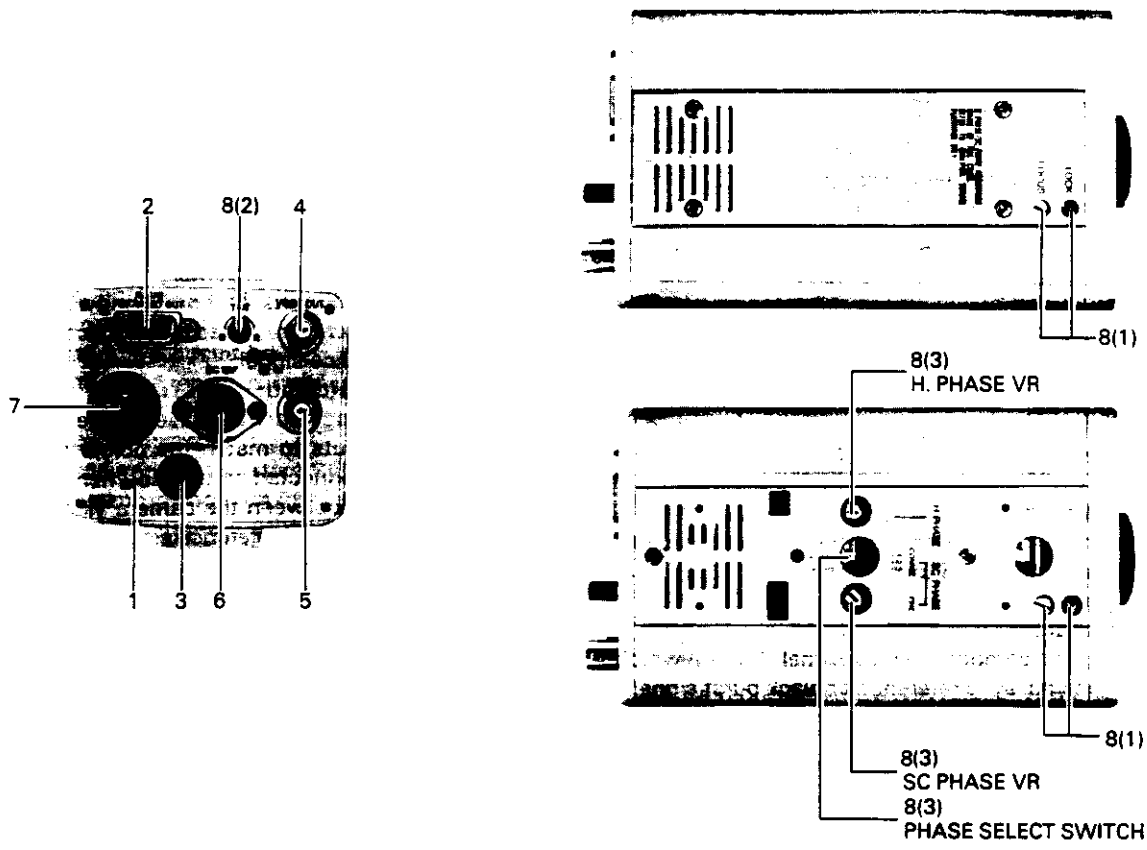
The AGC circuit incorporated in the camera head boosts the sensitivity automatically when the illumination on the subject is insufficient.
The AGC on-off switch is provided inside the camera, and has been set to ON (AGC operational) when the camera left the factory.
When the AGC function operates, the image becomes slightly more grainy.
If the AGC function is not required, ask your dealer to turn the switch off.

SPECIFICATIONS

Type:	Colour video camera head
Colour system:	PAL standard
Pickup element:	2/3" solid-state CCD (Charge Coupled Device)
Effective pixels:	500H x 582 V
Scanning:	625 lines, 2:1 interlaced
Synchronizing system:	Internal/external Automatic switching
Sync reference signal input:	Composite video signal (VBS)/1.0Vp-p, 75 ohms terminated (or black burst signal (B.B.)) Connector: BNC
Sync reference signal output:	Composite sync reference signal/ approx. 0.3Vp-p, 75 ohms, unbalanced Socket: D-sub 9-pin
Video signal output:	Composite video signal/1.0Vp-p, 75 ohms, unbalanced (2 outputs: BNC connector/D-sub 9-pin socket) R.G.B video signal/0.7Vp-p, 75 ohms, unbalanced (1 output: D-sub 9-pin socket)
Video S/N ratio:	45dB
Resolution:	320 TV lines (horizontal)
Minimum object illumination:	20Lux (F1.4 lens, AGC operational)
Recommended object illumination:	2,000 lux
White balance setting:	Indoor (approx. 3,200K)/Outdoor (approx. 5,500K), switchable
Lens mount:	C-mount
Power requirement:	DC12V (±10%) Ripple voltage: less than 50mV
Power consumption:	6.7 VA
Operating temperature range:	-5 to +40°C (23 to 104°F)
Operating humidity:	Less than 90% (without moisture condensation)
Dimensions (W x H x D):	88 x 85 x 158mm. (3-1/2" x 3-3/8" x 6-1/4"), without dust cap
Weight:	About 860g (1.9 lbs.), without dust cap
Provided accessories:	Dust cap x 1 Power cord x 1 Iris plug (for iris socket) x 1

Design and specifications subject to change without notice.

SPECIFIC SERVICE INSTRUCTIONS & PRECAUTIONS



■ Specific Service Items and Precautions

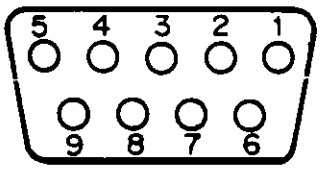
1. Setting the white balance switch

The white balance switch can be set without removing the body cover; it should be set in accordance with light conditions prevailing at the set-up location of the camera head to compensate for varying colour temperatures. The table below shows the three switch settings and their corresponding colour temperatures; use it as a guide for properly setting the switch.

Switch setting	Colour temperature
INDOORS	Circa 3,200°K
OUTDOORS (medium sunlight)	Circa 5,500°K

2. R/G/B, REF/VIDEO OUT connectors

For the R/G/B, ref. and video signal outputs.

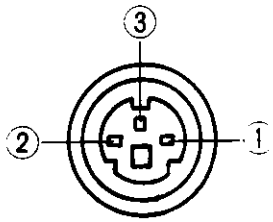


Pin No.	1	2	3	4
Terminal Name	GND (MAIN)	GND (COMP. VIDEO, SYNC)	R-OUT	G-OUT

5	6	7	8	9
B-OUT	COMP. VIDEO OUT	COMP. SYNC OUT	GND	GND

AUTO IRIS terminals
he IRIS plug of the mounted lens is to be plugged into iis terminal.

● **IRIS terminal pin assignment**

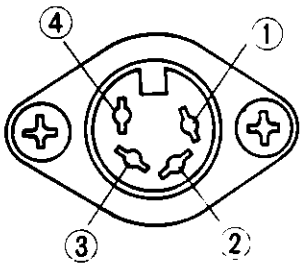


Pin No.	Pin designation
①	GND
②	Video
③	+9V DC (50mA max.)

4. **VIDEO OUT terminal**
For video signal output. Connect the VIDEO IN terminal of a video monitor or VCR to the terminal.

5. **REF IN terminal**
For inputting the composite video signal (1 Vp-p) which forms the external sync reference or black burst signal.

6. **DC 12 V input terminal**



Pin No.	Pin designation
①	+12 V
②	"
③	GND
④	"

7. **AF (AUTO FOCUS) LENS connector**
Connect the plug of the optional exclusive lens.

Pin No.	1	2	3	4	5	6
Terminal Name	12V DC	GND (12V)	9V DC	—	VIDEO	GND (VIDEO)

8. **Adjustment**
(1) In this camera head, the back focus can be adjusted from the outside. After adjusting, turn the LOCK adjusting screw clockwise to lock it.
(2) Tint volume
Factory setting: Mechanical center (click position)
Some lens will be produce no good white balance.
Adjust the tint VR when white balance is not good with used lens.
(3) When the top plate is removed, the H PHASE VR, SC PHASE VR and phase select switch adjustments can be performed.
- **H PHASE (horizontal phase) control**
For adjusting the horizontal phase of the camera video signal outputs, by comparing the phases between the camera video signal and the external sync reference signal.
- **SC PHASE (colour phase) control**
For adjusting the SC phase of the camera video signal outputs to match the colour phases of the cameras connected to one another, by comparing the phases between the camera video signals and the external sync reference signal.
- **PHASE SELECT switch**
If the phase cannot be adjusted by the H PHASE and SC PHASE VRs, change the setting of this switch. It is set at 3 position at the factory, and can be set to 1 or 2 position.

9. **Factory switch settings**
The switches have been set as shown below at the factory before shipping.
- White balance switch: INDOOR
- AGC switch : ON (In the PC board)
- TINT VR : Click position

■ **Two-side hole-through PC Board**

A two-sided hole-through PC Board is used on this camera. Patterns and wires are designed extra thin to attain highdensity component mounting. Rough handling may damage the patterns/wires or other components. When disassembling, repairing or adjusting the PC boards, exercise care **to avoid damage.**

■ **Repairing circuit board modules**

(1) Removing circuit board module

Pull out the circuit board, after removing solder completely with a solder sucker.

NOTE:

- Take care not to damage or remove solder from other parts.
- If more than two circuit boards are removed, make sure that they are replaced in the proper positions.

■ **Replacing chip components**

Use a soldering iron (temperature 260° ~ 300°C, about 17W) with a slim tip and high insulating ability. Those with a solder sucker (about 55W) are usually easier to use.

NOTE: This video camera uses many mini-flat ICs. To remove these, melt the solder while picking up the individual pin with fine tipped tweezers or cut off the IC pins. Take care not to scratch or peel off the BOARD foil pattern.

■ **Chip components display**

Besides the resistors, short jumpers, FET's, ceramic capacitors, transistors, and other chip components, the chip tantalum capacitors and chip variable resistor (CH VR) are used on the camera. None of these chip components are reusable again once they have been used.

NOTE: 1. Avoid rough handling of the VR
2. Use a thin-tip insulated-type screwdriver to adjust the CH VR.

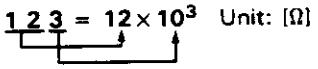
● **How to read printings**

On certain chip components, printing is applied as follows:

① **Chip metal glaze resistor (CH MG R)**

The diagram shown in **Fig. A** Ⓐ is applied to some of these resistors.

Reading method (Example)



② **Shorting jumper (0 [Ω] of CH MG R)**

No diagram is applied to shorting jumpers. A "0" is printed on Type Ⓐ shown in **Fig. A.**

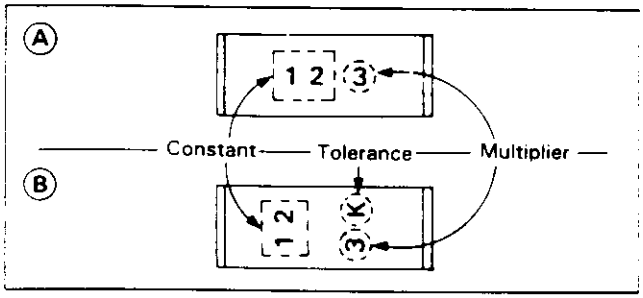
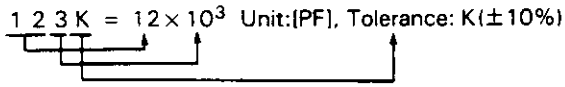


Fig. A Example of CH MG R/CH C Cap. codes

③ **Chip ceramic capacitor (CH C Cap.)**

- the diagram shown in **Fig. A** Ⓑ is applied to some of the CH C Caps. On some others, there is no diagram that is of any use to users.

Reading method (Example)



- As shown in **Fig. B** some chip ceramic capacitors are represented by two digits. **Table A** shows how those figures should be read.

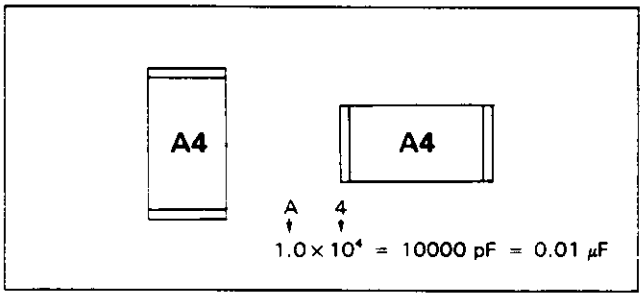


Fig. B Example of CH C Cap.

Alphabet	A	B	C	D	E	F	G	H	J	K
Constant	1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2	2.4
Alphabet	L	M	N	P	Q	R	S	T	U	V
Constant	2.7	3.0	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2
Alphabet	W	X	Y	Z		a	b	d	e	f
Constant	6.8	7.5	8.2	9.1		2.5	3.5	4.0	4.5	5.0
Alphabet	m	n	t	y						
Constant	6.0	7.0	8.0	9.0						

Numeral	0	1	2	3	4	5	6	7	8	9
Multiplier	10^0	10^1	10^2	10^3	10^4	10^5			10^{-2}	10^{-1}

Table A CH C Cap. capacity value

④ Chip Variable Resistor (CH VR)

A two-digit code is printed on some CH VRs. They indicate a reading method, as shown in **Table B.**

Three-digit codes are also used. these codes are read in the same way as those for CH MG R.

⑤ Chip Tantalum Capacitor (CH Tan. Cap.)

The diagram shown in **Fig. C** is applied to some of the CH Tan. Caps.

Reading method (Example)

The type shown in **Fig. C** is 10μF, 16WV chip tantalum capacitor.

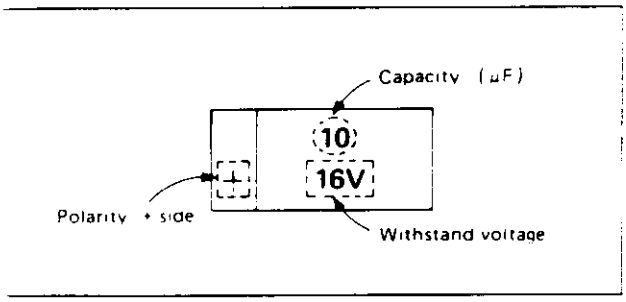


Fig. C Example of CH Tan. C Cap. codes

⑥ Chip Transistor

The labels shown in **Table C** are applied to the chip transistor.

Part No.	Display method
2SC2778(B,C,D)	K . B (denotes 2SC2778; parts ranking : B) / K . C / K . D
2SC2404(D)	U . D
2SD601(Q,R)	Y . Q / Y . R
2SD601A(Q,R)	Z . Q / Z . R
2SD1030(R)	1ZR
2SB709(P-R)	A . P / A . Q / A . R
2SB792(Q-T)	I . Q / I . R / I . S / I . T
2SB970(Q-S)	1RQ / 1RR / 1RS
2SA1022(C)	E . C

Table C Chip transistor labels

⑦ Chip FET

The following printing is applied to the Chip FET.

Part No.	Display method
2SK198(Q,R)	10 Q (denotes 2SK198; parts ranking : Q) / 10R
2SK316	1KP / 1KQ

Table D Chip FET codes

⑧ Chip Diode

The following labels are applied to the Chip Diode.

Part No.	Display method
MA151WA	M N (denotes MA151)
MA151K	M . H
MA151WK	M . T
MA151A	M . A
MA157	M . R
MA3051	5.1
MA3120(L-H)	12H / 12L / 12M

Table E The display of chip diode

Code	12	22	32	52	72	13	23	33	53	73	14
Resistance Value	100 Ω	220 Ω	330 Ω	470 Ω	680 Ω	1 kΩ	2.2 kΩ	3.3 kΩ	4.7 kΩ	6.8 kΩ	10 kΩ
Code	24	34	54	74	15	25	35	55	75	16	
Resistance Value	22 kΩ	33 kΩ	47 kΩ	68 kΩ	100 kΩ	220 kΩ	330 kΩ	470 kΩ	680 kΩ	1 MΩ	

Table B CH VR resistance value display method in two-digit

"CHARGE COUPLED DEVICE (CCD)" IMAGER

1. Precautions for handling and replacing CCD imager

CCD is characteristic of many advantages, but it also has some disadvantages. The following are measures to deal with these disadvantages.

(1) CCD imager is a circuit element which is very sensitive to static electricity.

- The potential differences caused by the electrostatic charge – which have been accumulated in the clothing and human body – sometimes destruct the insulation of the CCD imager. Therefore, handle the "high-priced" CCD imager with more attention thereto than to the C-MOS (Complementary MOS), especially during the dry season and in dry places.
- Maintain the CCD imager in the provided pack or aluminum foil so that it can be kept at the same potential. Never unpack its container until the very moment of servicing.

(2) The CCD imager is easily damaged by dust. Also it suffers considerable deterioration, when exposed to strong light.

- When servicing, make sure that the CCD imager is kept free from such foreign material as dust. Use dry soft cloth or soft cloth moistured with ethylalcohol to wipe off the foreign material.
- Do not exposed the CCD imager to such strong light as direct sunlight.

(3) The CCD imager is damaged instantly by the following malfunctions. Pay close attention to these malfunctions before servicing.

① The voltage of only the 20-V Line has dropped.
② The output terminal of the pin (11) is short-circuited.
③ The PD (pre-charged drain bias) terminal of the pin (14) has turned negative.

2. Arranging CCD imager and ROM (for compensating the CCD imager) in pairs

- Both the "CCD imager mounted on the imager board" and the "ROM mounted on the main board" are arranged in pairs to optimize their individual characteristics. Neither the CCD imager nor ROM can be replaced individually, because each ROM is manufactured to conform to the requirements for its corresponding CCD imager.
  (Each ROM has its own "pair number" sealed.)
  NOTE:
  - No ROMs are provided with some CCD imagers which do not require compensation.
  - The adjusting ROM is installed in the shielded case on the bottom of the main board.

3. Supply and replacement of individual CCD imagers and compensating ROMs (Refer to Table 1.)

- The CCD imagers supplied for servicing are available in two types according to the characteristics. Service as follows depending upon the given situation:

(1) When a pair of CCD imager and the compensating ROM is supplied at the same time (with its pair numbers sealed individually)

- Replace the CCD imager and the compensating ROM at the same time.
  When the compensating ROM is not mounted on the main PC board, install the newly-supplied compensating ROM after removing the four chip jumpers.

(2) When only a CCD imager is supplied (without its corresponding ROM)

- Replace the CCD imager only, since no compensation is required for the CCD imager.
  However, if the compensating ROM is also defective, also remove the ROM and then install the four chip jumpers for shorting at the specified positions.

4. Supply and replacement of imager board ass'y and main board ass'y (Refer to Table 2)

The PC board ass'y supplied for service parts has no CCD imager or compensating ROM. Use the CCD imager and the ROM by removing them from the repair set.

- When the compensating ROM is not installed on the board for repair, replace the whole of the board.
- When the compensating ROM is installed on the board for repair, the ROM should also be replaced.
  In this case, first remove the four chip jumpers from the newly-supplied board, then remove the compensating ROM from the board for repair and install it on the supplied board.

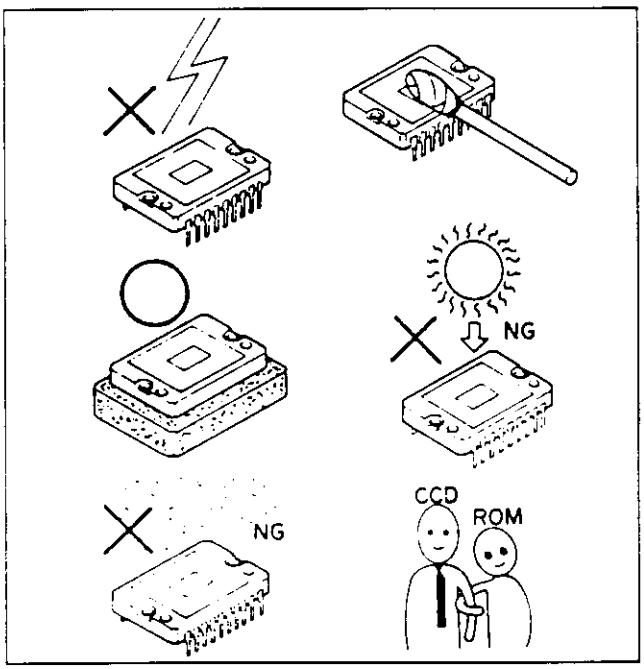


Table 1 Replacement of CCD and ROM for PAL (When CCD/ROM is defective)

<table>
<tr><th>Item</th><th>Case 1</th><th>Case 2</th></tr>
<tr><td>Condition of repair set

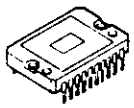
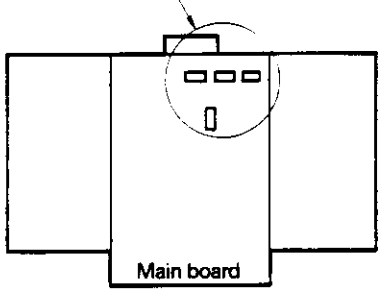
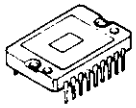
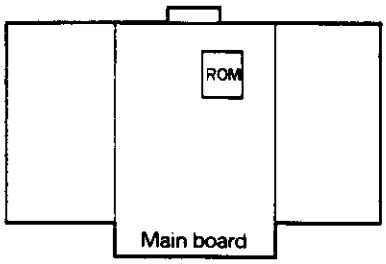
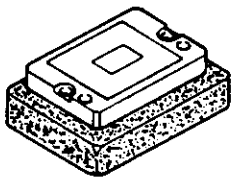
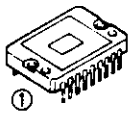
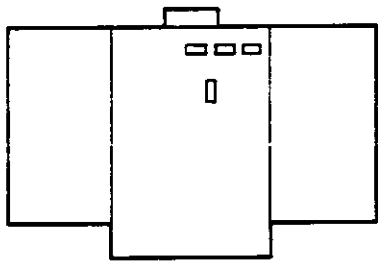
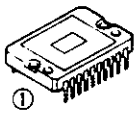
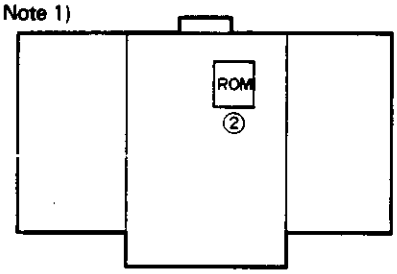
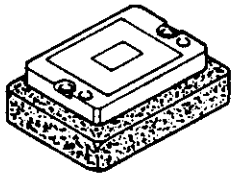
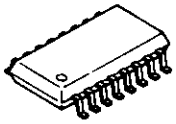
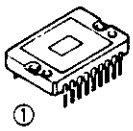
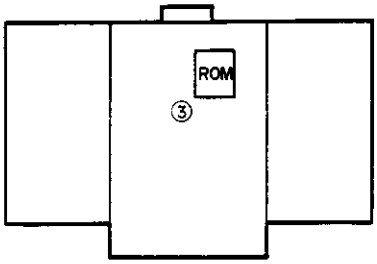
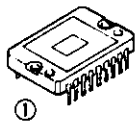
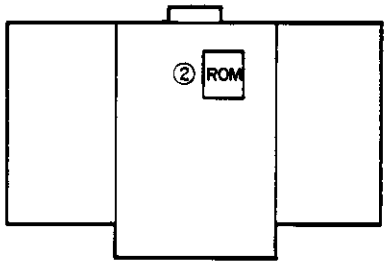
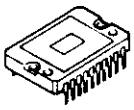
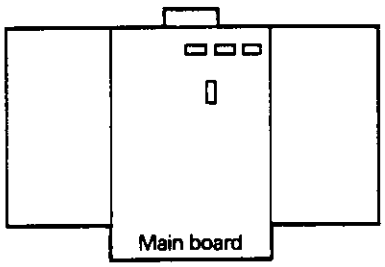
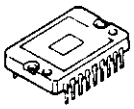
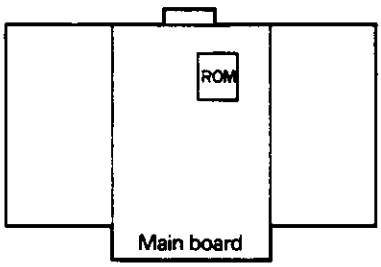
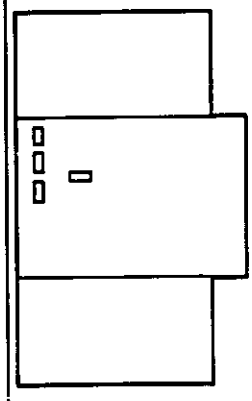
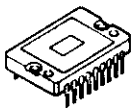
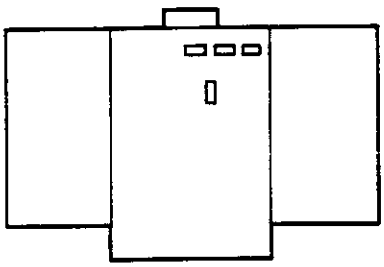
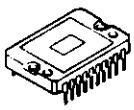
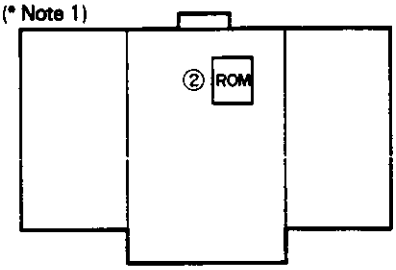
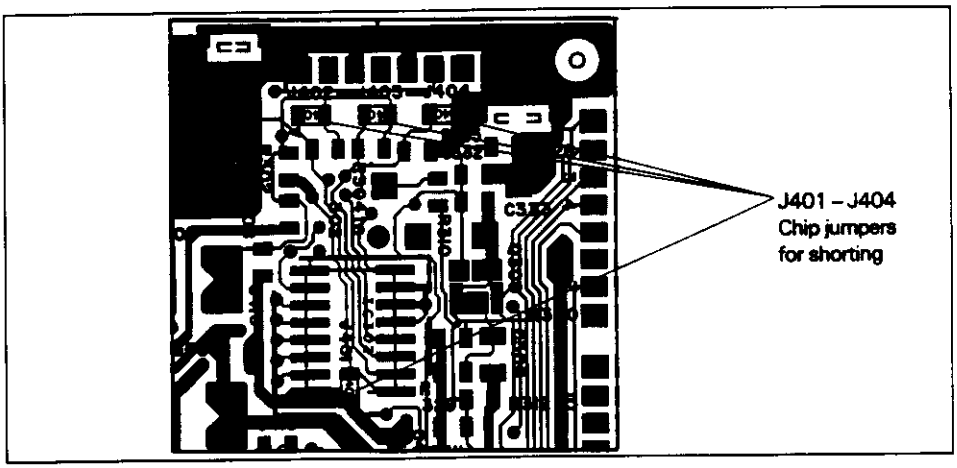
Supplied parts</td><td>● CCD (without ROM)
● With chip jumpers
 
CCD
Chip jumper (× 4)
(J401 – J404) (* Note 1)
 
(Rear view)</td><td>● CCD (with ROM)
 
CCD
  </td></tr>
<tr><td>CCD only
  </td><td> 
① Replace the ROM.
(Leave the chip jumpers as they are.)
  </td><td> 
(A) When the ROM is not defective:
① Replace the CCD.
(Leave the ROM as it is.)
(B) When the ROM is defective:
① Replace the CCD.
② Remove the defective ROM.
③ Install the specified chip jumpers at four points.) (* Note 1)
③ Chip jumper (× 4)
(J401 – 404)
(* Note 1)
  </td></tr>
<tr><td>CCD + ROM
 
+
  </td><td> 
① Replace the CCD.
② Remove the chip jumpers. (* Note 1)
③ Install the ROM.
② Chip jumper (× 4)
(J401 – J404)
(* Note 1)
  </td><td> 
① Replace the CCD.
② Replace the ROM.
  </td></tr>
</table>

Table 2 When PC Board is defective (For PAL) (Also replace CCD/ROM when CCD/ROM is defective)

Item	Case 1	Case 2
Condition of repair set / Supplied board (without ROM, with chip jumpers)	● CCD (without ROM) ● With chip jumpers   (Rear view)	● CCD (with ROM)  
 ● With chip jumpers (J401 – J404) ● Without ROM	① Replace the board.  	① Remove the chip jumpers from the supplied board. (* Note 1) ② Remove the ROM from the repair board and install it on the supplied board. Note: When the ROM is also defective,replace the CCD/ROM too.  ① Chip jumper (× 4) (J401 – J404) (* Note 1) 

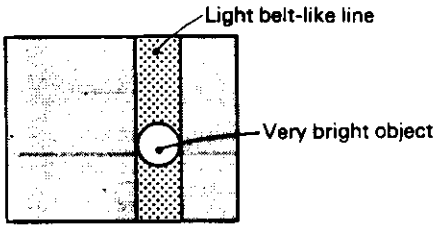
(* Note 1): The installing positions of the shorting chip jumpers are around the front side of the rear of the center main board.



■ SPECIAL CHARACTERISTICS OF A CCD

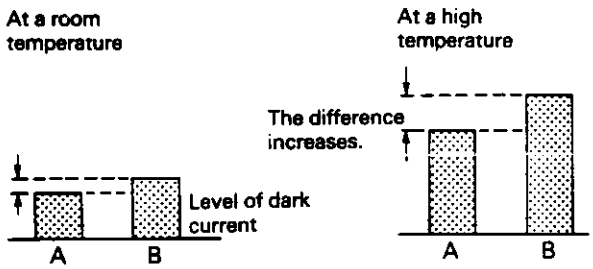
Smear phenomenon
This phenomenon occurs when shooting a very bright object (such as electronic light, fluorescent lamp, the sun or a strong reflection).

Video monitor screen



Due to the interline-transfer organization of the CCD image sensors (Refer to "The Interline-transfer Organization of the CCD Image Sensors"), this phenomenon is caused by electronic charges generated beneath the photosensors by a light with a long wavelength, such as an infrared light.

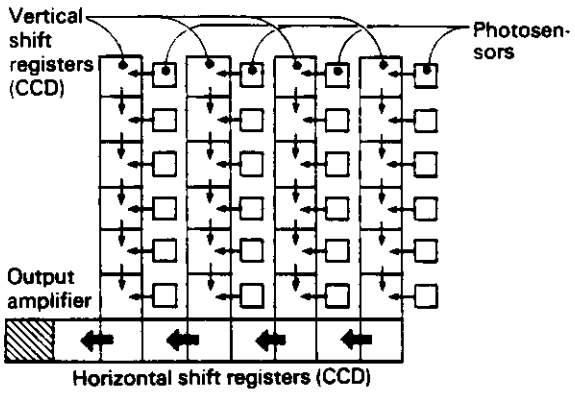
Patterned noise on the picture at high temperatures
Dark current (thermal noise) is inherent in semiconductors. At room temperature, the amount of dark current in all photosensors is very close but as the temperature rises, the amount of dark current increases. As a result, the relative difference between the dark current of each photosensor increases, and this difference causes the patterned noise on the picture.



False signal
When vertical stripes or straight lines are shot, they may look wavy.

Blemishes
The photosensor elements generate electronic charges which ultimately produce horizontal and vertical rows in the CCD image sensor.
Therefore, any malfunctioning photosensor element will eventually cause a blemish on the monitor screen.

The interline-transfer organization of the CCD image sensors
This CCD video camera module adopts an interline-transfer organization in which precisely aligned photosensors and vertical shift registers are arrayed interlinearly and a horizontal shift resister links up with the vertical shift register, as shown. Light variations are sensed by the photosensors, which generate electronic charges proportional to the light intensity. The generated charges are fed into the vertyical shift registers all at one. The charges are then transferred from the vertical shift registers to the horizontal shift registers successively and finally reach the output amplifier to be read out successively.



REMOVING CASINGS, COVERS AND OTHER COMPONENTS

■ **Disassembling/Replacing Each Component**

- Before removing components, be sure to cut off the power supply.
- When disassembling/replacing, be sure to mount the dust cap to protect the CCD imager and optical low-pass filter.

1-1. How to remove the body cover

(1) Remove the four screws ⓐ shown in Fig. 1 to remove the top cover.
(2) Remove the two screws ⓑ shown in Fig. 1 to remove the top cover ass'y by lifting it up.

1-2. How to remove the bottom cover

(1) Remove the four screws ⓒ shown in Fig. 1 to remove the tri-base ass'y.
(2) Remove the two screws ⓓ shown in Fig. 1 to remove the bottom cover.

1-3. How to remove the main PC board

(1) Remove the four screws ⓔ shown in Fig. 1, and both left and right mother PC boards can be removed.

1-4. How to remove the front cover

(1) Remove the four screws ⓕ shown in Fig. 1.
* In this condition, each adjustment can be performed.

1-5. How to remove the rear plate and rear cover.

(1) Remove the four screws ⓖ shown in Fig. 1.

Note: When installing the covers, be sure to install the top cover first.
If the front cover is installed first, it is difficult to install the top cover.

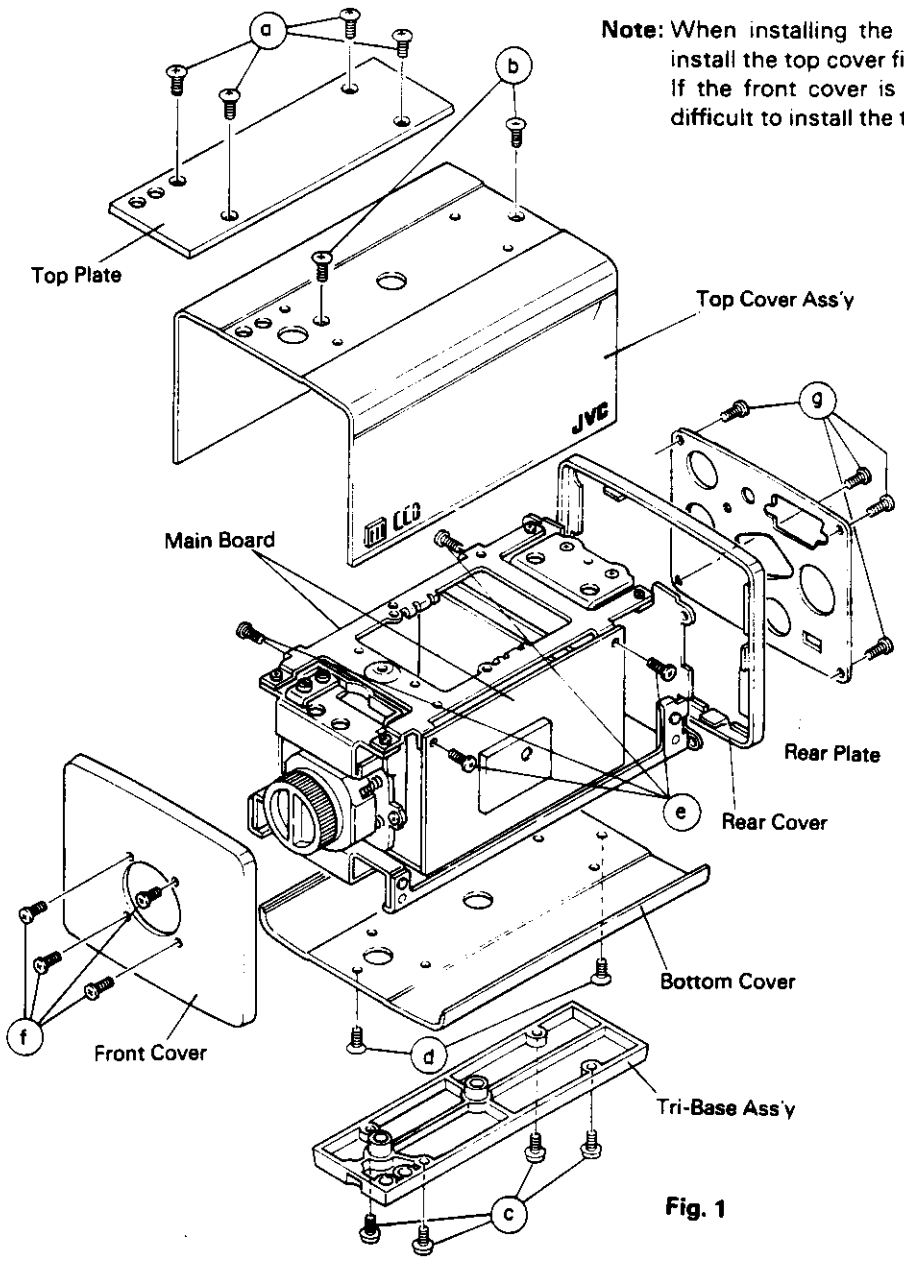


Fig. 1

2-1. How to remove the top beam
Remove the four screws ⓐ shown in Fig. 2.

2-2. How to remove the terminal ass'y
Remove the four screws ⓑ shown in Fig. 2.
NOTE: Be careful not to cut the lead wires since they are left connected.

2-3. How to remove the CCD imager and imager PC board
(1) Remove the two screws ⓒ shown in Fig. 2.
(2) Disconnect four connectors and the grounding lead from the imager PC board. Now the CCD imager and imager PC board can be removed completely.

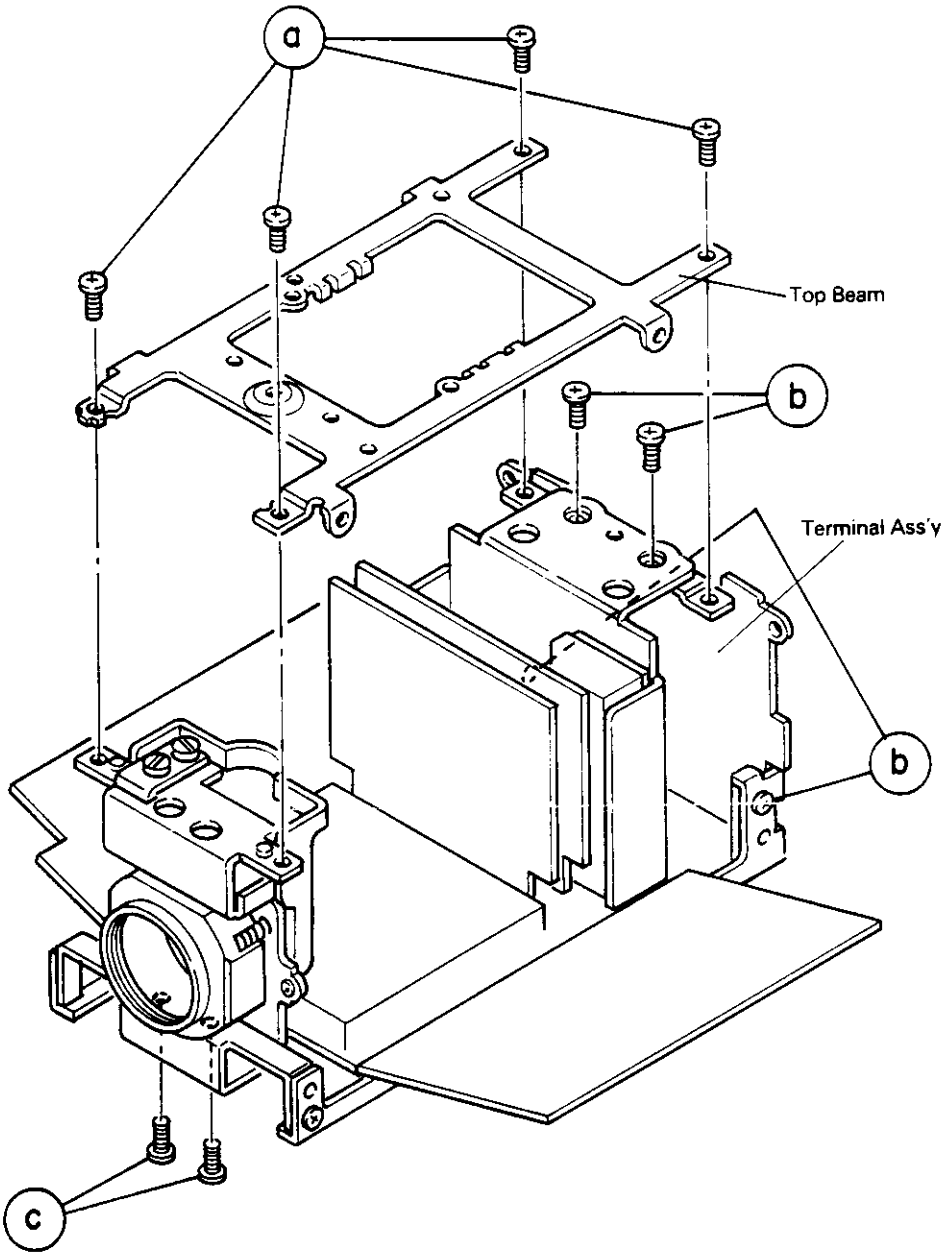


Fig. 2

3. How to disassemble the CCD imager

* Remove 2 nuts shown in Fig. 3 Ⓐ.

(1) Remove the imager PC board shown in Fig. 3 by pulling it in the direction of Ⓑ.

(2) Remove the two screws ⓐ shown in Fig. 3 to remove the CCD imager holder and the CCD imager.

NOTE: At this time, the imager rubber is removed, so take extra precaution not lose it.

(3) Remove the two screws ⓑ shown in Fig. 3, to remove the CCD imager.

(4) Remove two screws ⓒ shown in Fig. 3 so as to disassemble the CCD imager unit into the adjust B ass'y, C mount and adjust ring.

NOTE: At this time, the four springs are removed, however, do not lose them.

4. How to remove the optical low-pass filter

Remove the two screws ⓓ shown in Fig. 3, and the optical low-pass filter can be removed.

NOTE: The optical low-pass filter can also be removed by removing the dust cap from the outside.

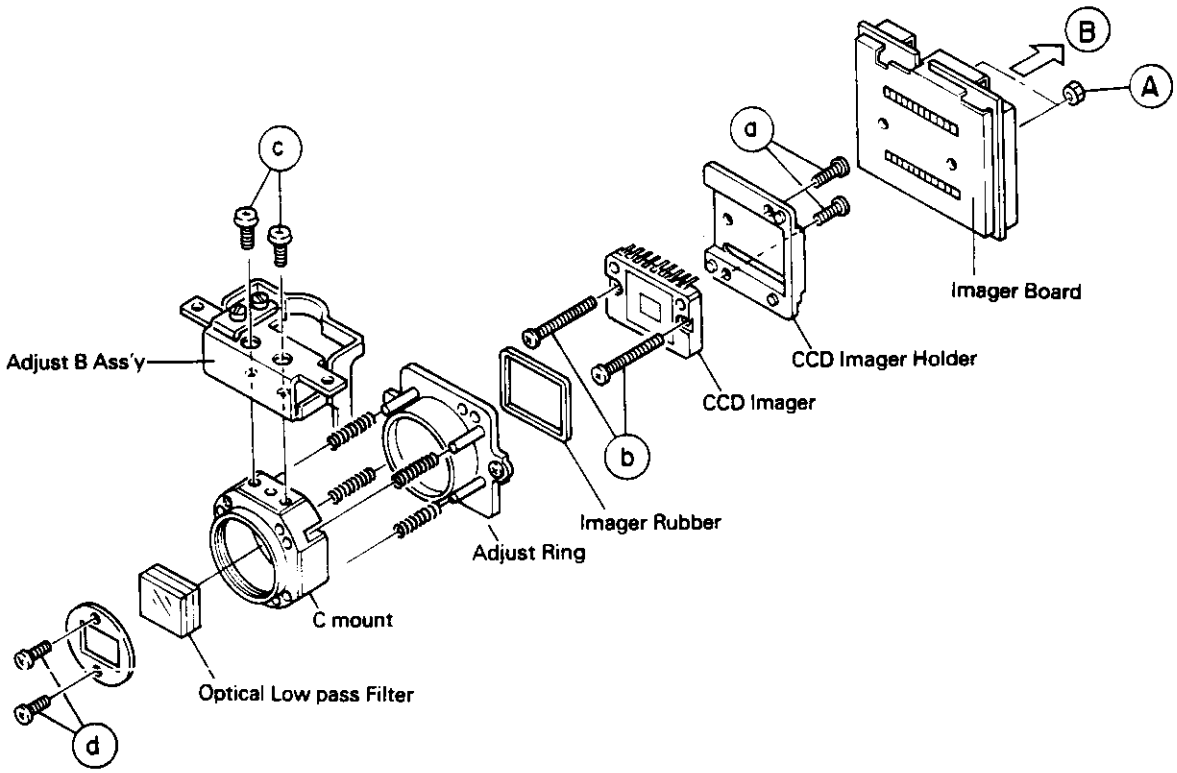


Fig. 3

2. ADJUSTMENT

MEASURING INSTRUMENTS, TOOLS AND FIXTURES FOR ADJUSTMENT

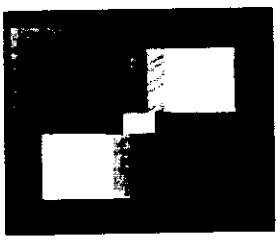
■ MEASURING INSTRUMENTS

1. **Oscilloscope** 1
2. **Color monitor TV (PAL-type, it is desirable that it is is equipped with an RGB connector)** 1
   Color temperature: 9,300K
3. **Lights** ..... 1 or 2
   Color temperature: 3,200K
4. **Frequency counter** 1
5. **DIGITAL DC voltmeter (DVM)** 1
6. **Power supply** 1
   Voltage: 12 V DC
   VTR power, AC adaptor or AC adaptor + Camera cable
7. **Vectorscope (PAL-type)** 1
   Used only if necessary.
8. **Waveform monitor (PAL-type)** 1
   Used only if necessary.

■ TOOLS AND FIXTURES

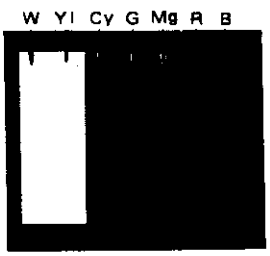
1. Patterns (Gray scale pattern) (White pattern) (Color bar pattern)

Note:
Reflection-type patterns eventually suffer from drops in signal output level or loss of output uniformity. Periodic replacement is recommended.



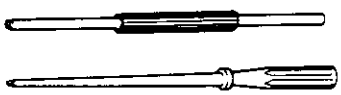
GS-2A*
Reflective type (γ = 2.2)

WC-2A*
Reflective type



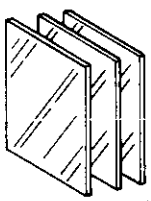
Reflective type **CC-2A***
Transmissive type: **CC-2T***

2. DRIVERS



Adj. driver

3. COLOR TEMP. CONVERSION FILTER

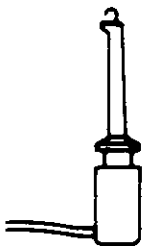


80C + CC10C + CC10B

KODAK wratten No. 80C, CC10C and No. CC10B gelatin filter

When servicing, this unit can be adjusted using only the KODAK Wratten No. 80C gelatin filter or HOYA No. 80C filter

4. PIN CLIP



MJ-025*

Slightly bending the pin tip facilitates its use.

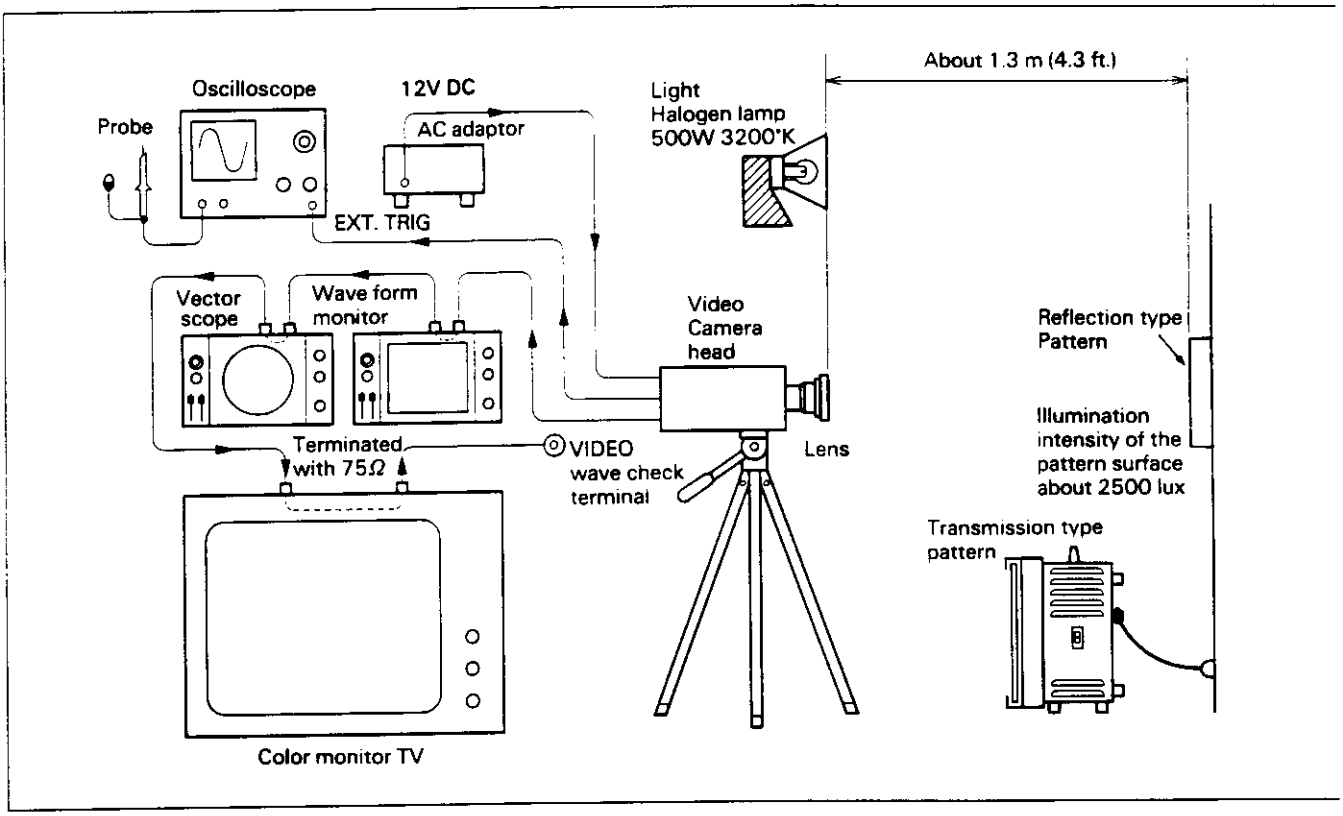
5. LENS

C-mount lens for 2/3" ITV camera
Iris can be controlled manually.

- Lens flange-back should be standard
- Zoom lens is recommended

Note:
Parts marked with an asterisk (*) can be ordered from the following section:
PARTS SECTION OF THESALES ENGINEERING DEPARTMENT, TELEVISION RECEIVER DIVISION.
Parts that is not marked with asterisk (*) are able to get at your side.

INSTRUMENT CONNECTION AND SET UP

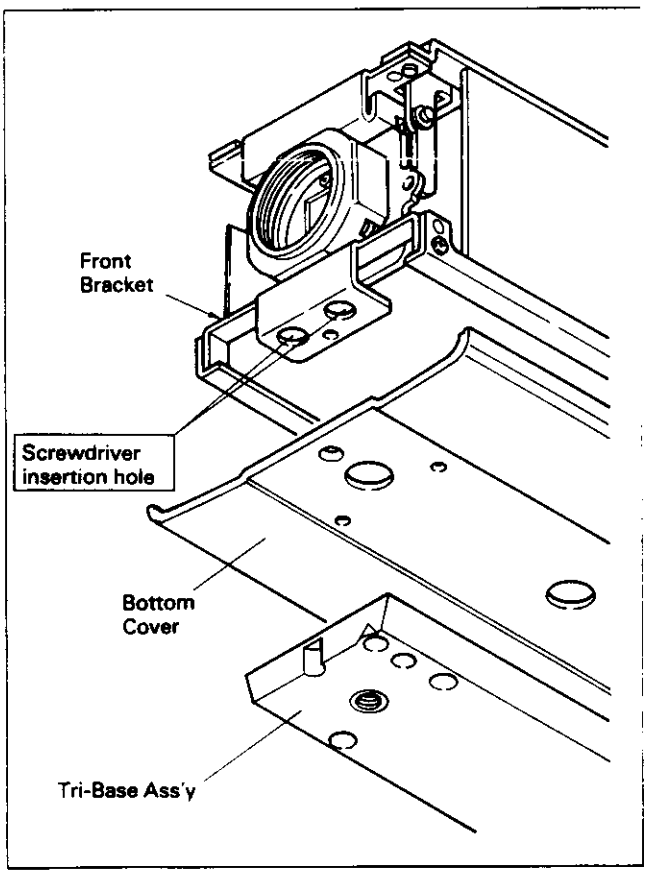


■ VIDEO CAMERA HEAD INSTALLATION ON TRIPOD

This camera provides an exclusive tripod mounting hole behind the bottom cover and the tri-base ass'y. Therefore, when adjusting the camera with the tripod mounted, it can be mounted temporarily to the tripod using either of the screwderiver insertion holes on the front bracket.

Notes:

- When mounting, be careful not to drive the screw of the tripod excessively. (If not, the camera might not be fixed.)
- Be sure to perform adjustment after confirming that the camera has been secured firmly.



PRIOR TO STARTING ADJUSTMENT

(1) Warming up

Before adjustment, turn on the camera to warm it up for more than 10 minutes so that the camera operation may be stabilized.

(2) Lighting

- Adjust the distance between the light and pattern so that the illumination on the pattern is about 2,500 lux and the illumination over the entire pattern surface is as uniform as possible.
- Correct adjustment will be impossible if the illumination is too high, too low or uneven.

(3) About CCD Imager

The CCD image is susceptible to static electricity. The insulator of this element might be damaged if a potential difference is caused by the electrostatic charge carried by clothes or body. Be careful when holding it because it is costly. Use special care in a dry atmosphere in a dry season.

ADJUSTMENT PROCEDURES

1. Presetting

Before adjustment, preset the following switches:

1) TINT VR "Click" position (center)
2) AGC switch "OFF" (opposite to lens)
3) White Balance switch " ☼ " (in-door)

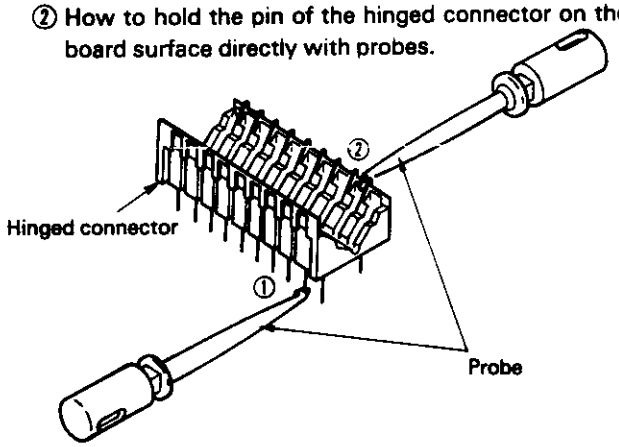
2. In holding a test pin with a probe, take care set contact with any other pin. The CCD imager will be damaged if some test pins are accidentally connected.

3. Test points

- When the hinged connector is the point to be tested (such as when (24): 8.5V, (4): R-Y, (48): MAX)

① How to hold the pin of the hinged connector from the back of the board using probes.

② How to hold the pin of the hinged connector on the board surface directly with probes.



- Connect the ground cable to the ground terminal on the PC BOARD (e.g. (32) **(GND)** on the hinged connector).

  If the ground cable is connected to the chassis frame, the waveform will be distorted.

4. EXT. TRIGGER

Connection to external trigger signal of oscilloscope

In adjusting the signal system, connect a 1 kΩ resistor to **TP-309 (TP-ID)** on Main PC BOARD to get the trigger signal if necessary.

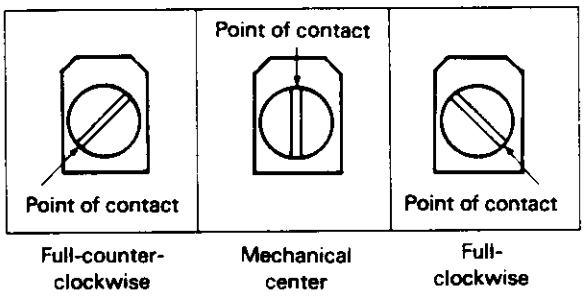
5. JUST SCAN

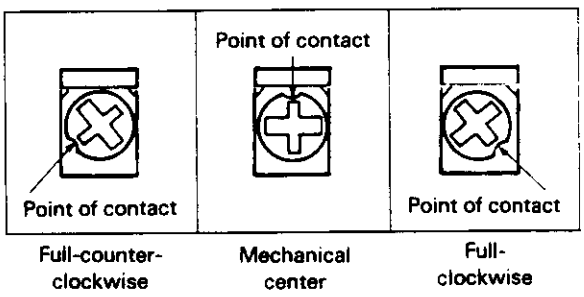
Unless otherwise specified, apply "just scan" to all pattern adjustments.

6. **Repeat adjustments** optimum conditions are established.

7. Chip VR

Chip VR rotating position is designated as shown in the figure below for the convenience of explanation, since the chip VR can be rotated 360°.

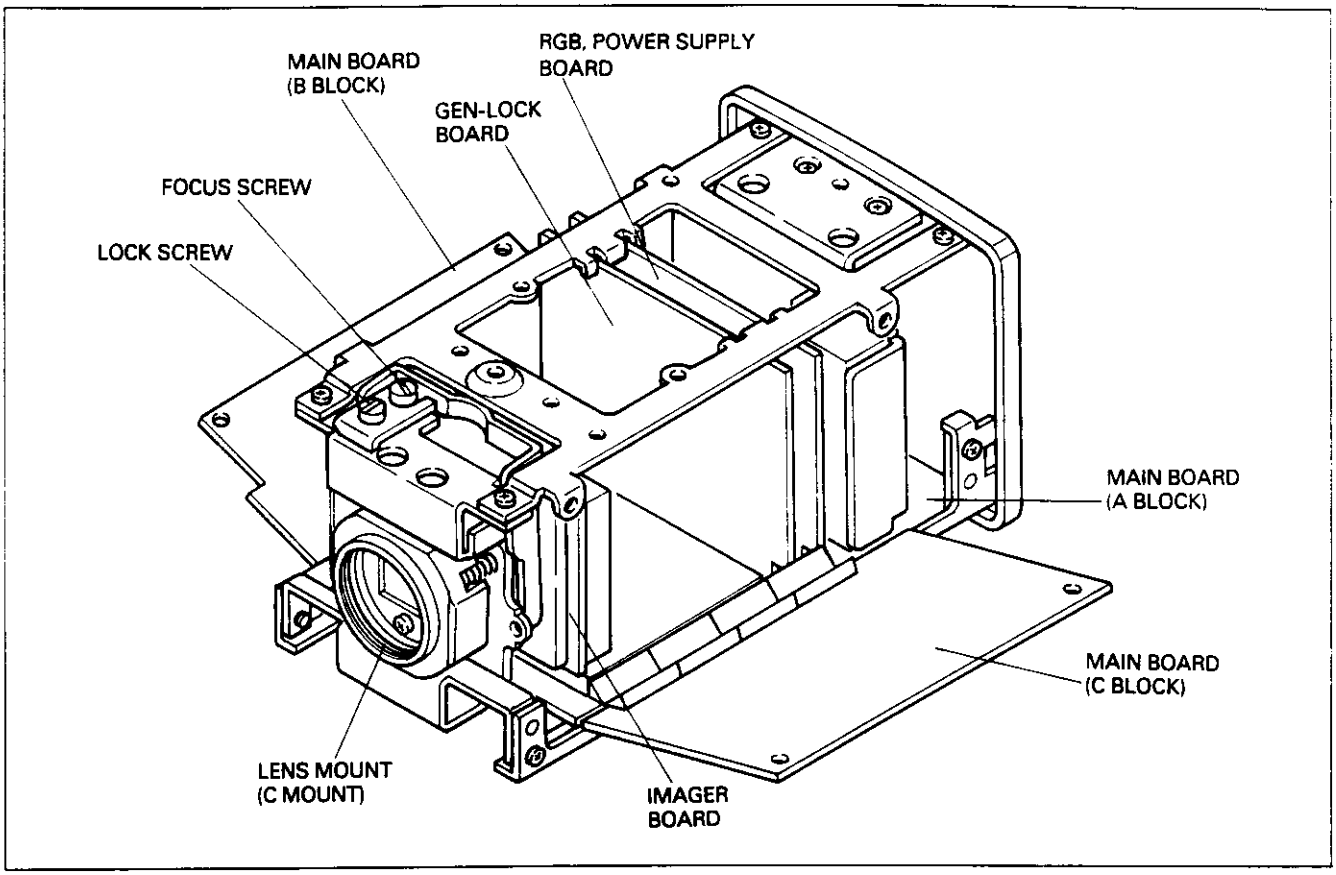


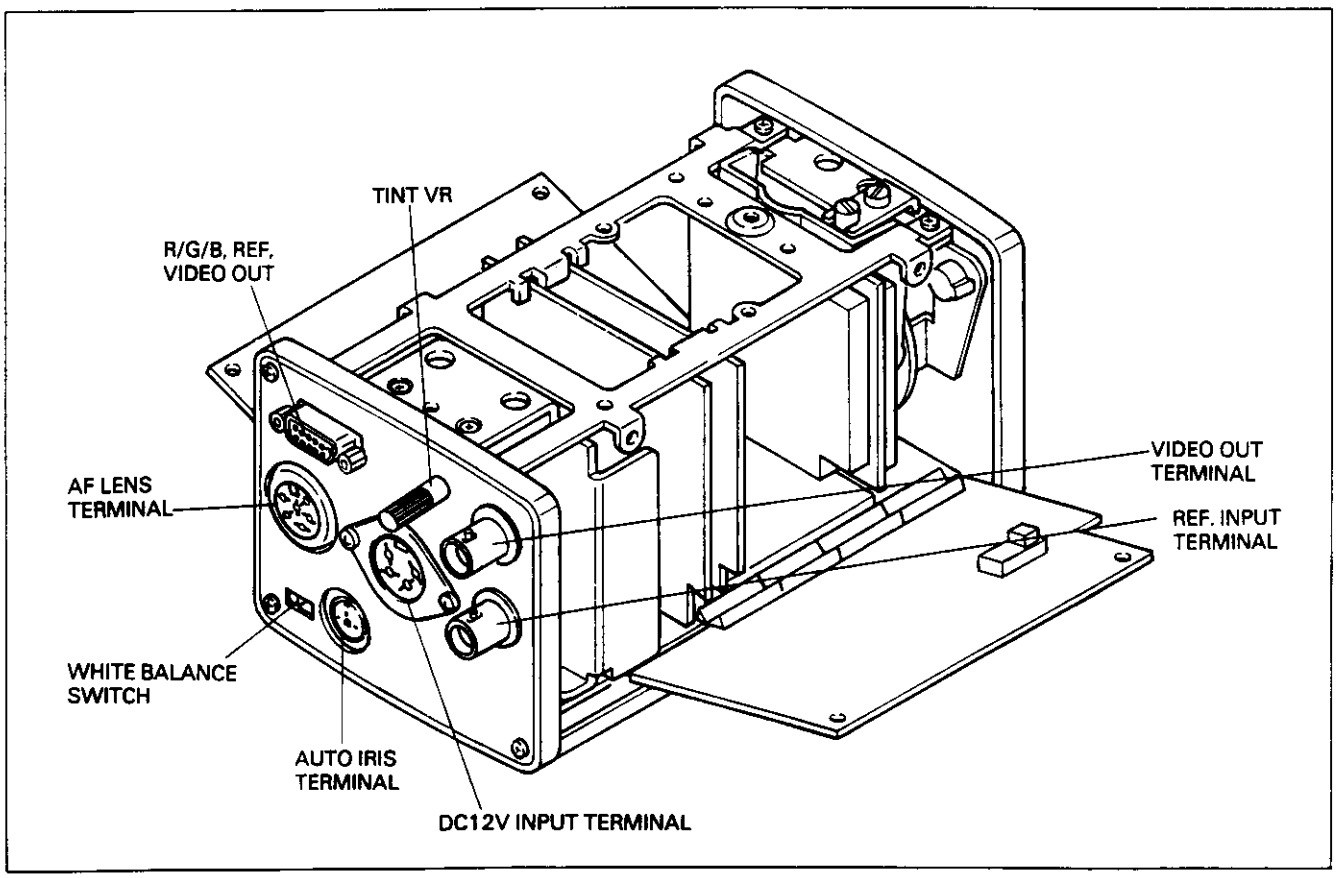


8. No Adjustment of unspecified VRs

Never rotate VR's other than those specified by this Instruction Manual.

MAIN PARTS ARRANGEMENT AND LOCATIONS OF BOARDS





ADJUSTING STEP

1. ADJUSTMENT OF THE POWER

1 8.5V Adjustment
↓
SSG Adjustment

2. ADJUSTMENT OF THE SSG

NOTE: This adjustment is normally not necessary. It is possible to skip to the "ADJUSTMENT OF THE SIGNAL SYSTEM" of the next step.

A 14 MHz OSC Adjustment
↓
B 28 MHz OSC Adjustment
↓
SIGNAL SYSTEM Adjustment

3. ADJUSTMENT OF THE SIGNAL SYSTEM

1 MAX GAIN Adjustment
↓
2 WHITE BALANCE Coarse Adjustment
↓
3 IRIS SET Adjustment
↓
4 R.G.B. DET Adjustments
↓
5 γ Adjustment
↓
6 PEDESTAL Adjustment
↓
7 OUTPUT WAVEFORM LEVELs Adjustment
↓
8 MPX Adjustment
↓
9 CARRIER BALANCE Adjustment
↓
10 Y. SET UP Adjustment
↓
11 AUTO IRIS Adjustment
↓
12 Y KNEE Adjustment
↓
13 WHITE CLIP Adjustment
↓
14 AGC SET Adjustment
↓
15 APACON Adjustment
↓
16 SYNC LEVEL Adjustment
↓
17 BURST LEVEL Adjustment
↓
18 IN-DOOR WHITE BALANCE Adjustment
↓
19 COLOR PRODUCIBILITY Adjustment
↓
20 OUT-DOOR WHITE BALANCE Adjustment
↓
21 IRIS VIDEO LEVEL & IRIS SYNC LEVEL
↓
22 BACK FOCUS Adjustment
↓
23 FINAL CHECK

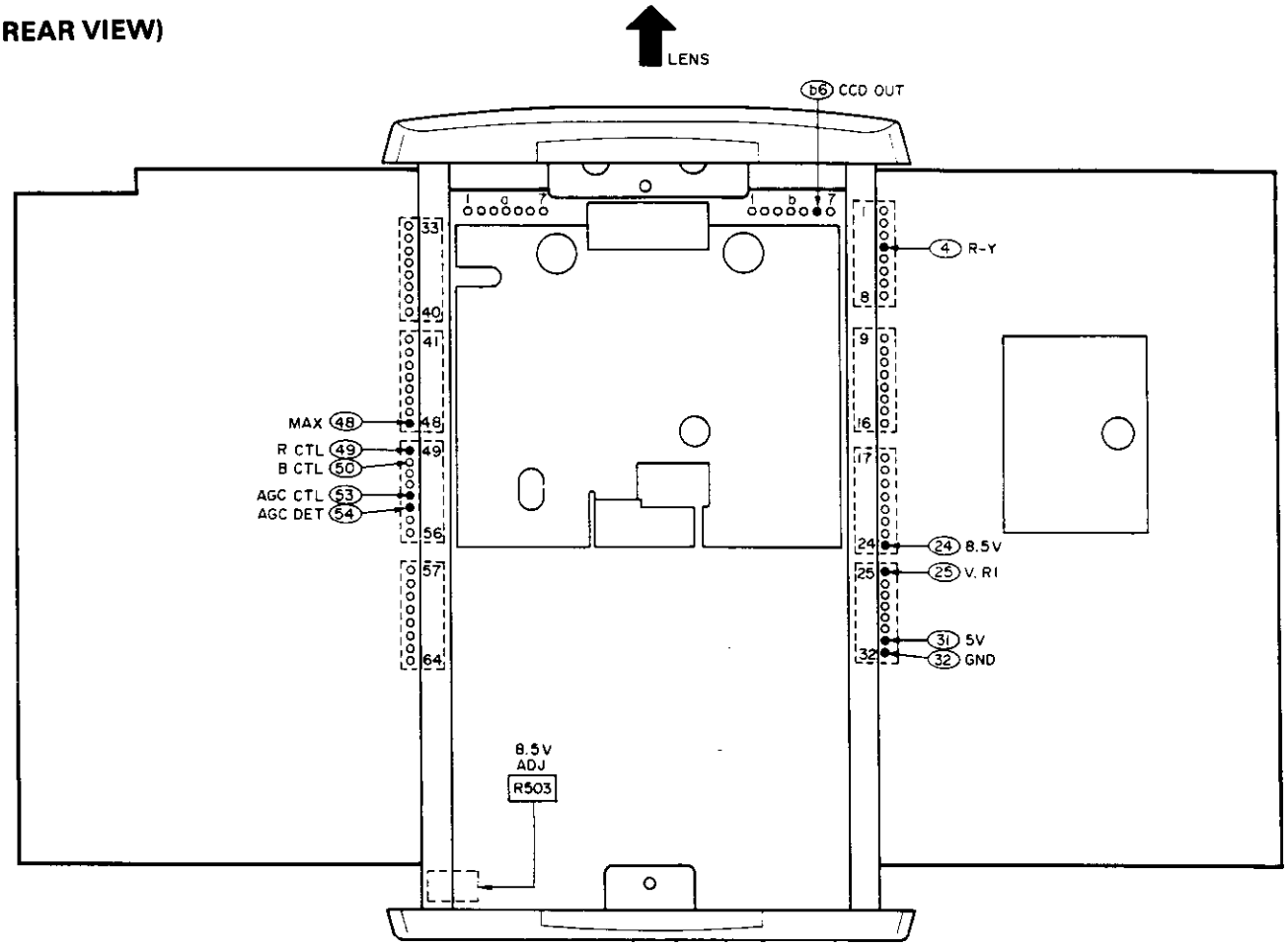
4. ADJUSTMENT OF RGB CIRCUIT

[Proceed to this adjustment only after having completed the adjustments 1 to 3.]

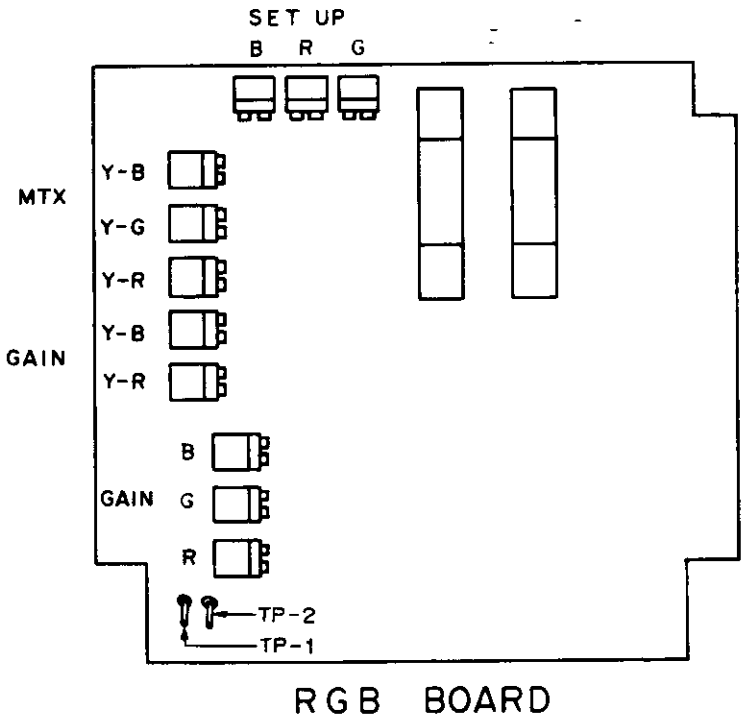
1 Chroma Difference Signal Adjustment
↓
2 Chroma Difference Signal, Gain Adjustment
↓
3 RGB Gain Setup Adjustment
↓
4 Confirmation

ADJUSTMENT LOCATIONS

(REAR VIEW)

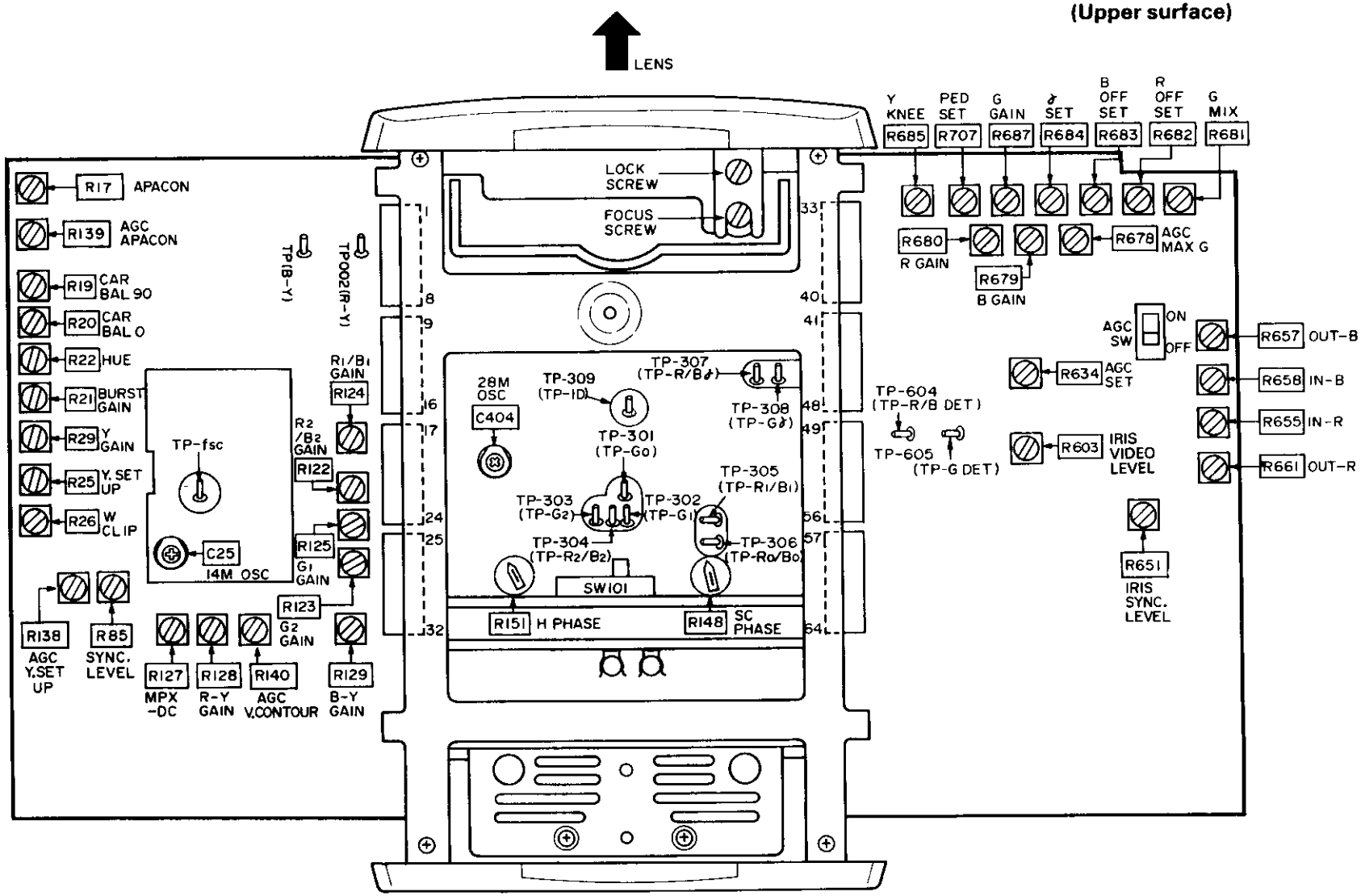


(RGB, POWER PC BOARD)

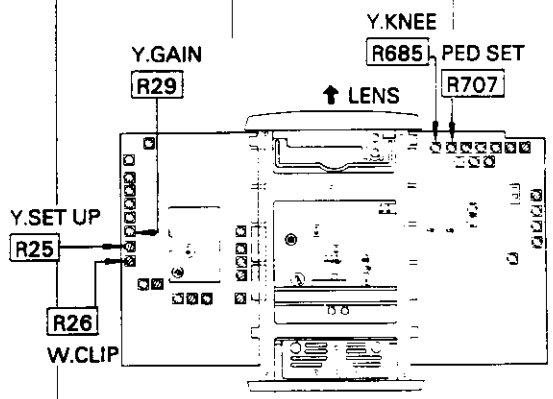


RGB BOARD

(Upper surface)

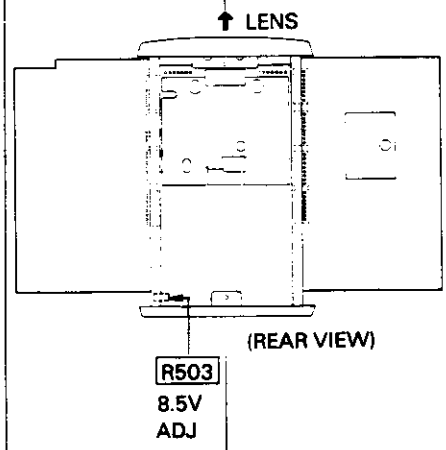


● PRESETTING

A To obtain a picture		If a picture is not obtained, preset the following VRs as indicated. **If a picture is already obtained or fine adjustment is to be made later, presetting is not necessary.** **R707 (PED SET) → Mechanical center** **R685 (Y KNEE) → Turn fully counter clockwise** **R25 (Y SET UP) → Mechanical center** **R26 (W CLIP) → Turn fully counter clockwise** **R29 (Y GAIN) → Mechanical center** **(Note)** Set all VRs so that a picture and colour are obtained.

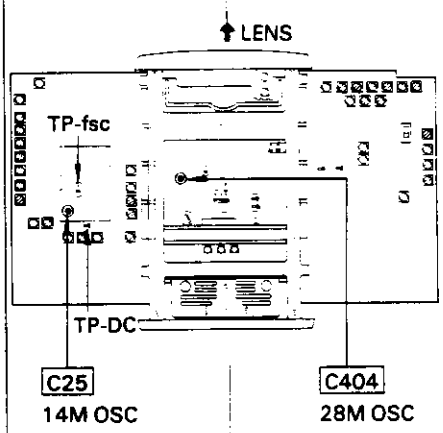
1. ADJUSTMENT OF THE POWER

No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
1.	8.5V Adjustment	DC Voltmeter	(24) (8.5V)	R503 (8.5V ADJ)	Adjust **R503 (8.5V ADJ)** until the DC voltmeter indicate **8.5 ± 0.05V** on the scale. **NOTE:** Use a correctly calibrated DC voltmeter. See that a correct tester is always used.



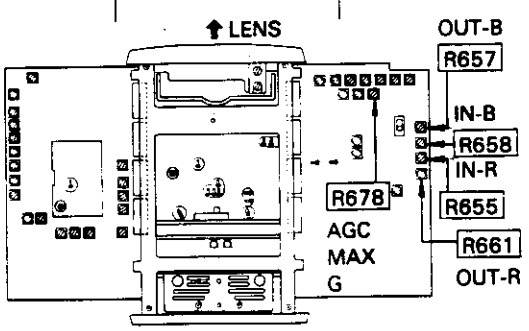
2. ADJUSTMENT OF THE SSG

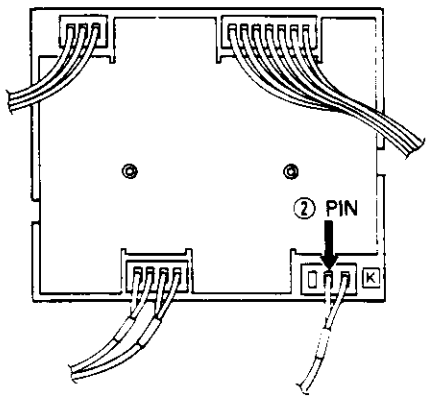
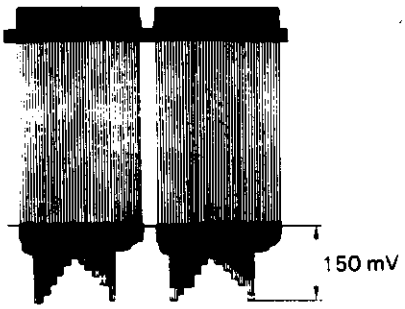
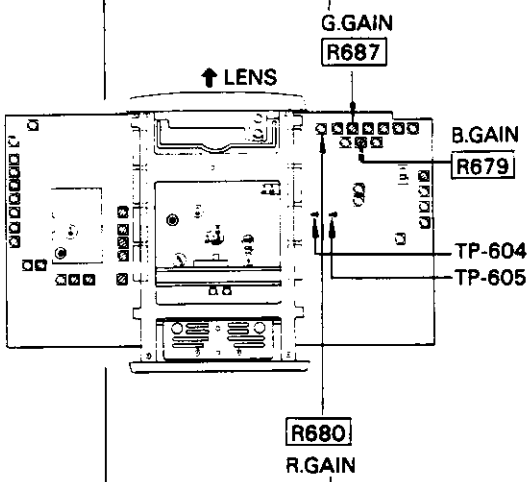
No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
1.	**SSG Adjustment**	This adjustment is only done when repairing the SSG IC and peripherals that require adjustment. ● In most cases, this adjustment is unnecessary. Proceed to "**3. ADJUSTMENT OF THE SIGNAL SYSTEM.**			
A	**14MHz OSC Adjustment**	**Frequency counter** **DC power supply (DC 4.43V)**	**TP-fsc** **TP-DC**	**C25 (14M OSC)**	1. Apply 4.43V DC to TP-DC. 2. Rotate trimmer **C25 (14M OSC)** the frequency counter connected to **TP-fsc** indicates **17.734476 MHz** ±5 Hz. 3. Stop applying 4.43V to TP-DC.
B	**28MHz OSC Adjustment**	**Frequency counter**	**TP-fsc**	**C404 (28M OSC)**	1. Rotate trimmer **C404 (28M OSC)** the frequency counter connected to **TP-fsc** indicates **17.734476 MHz** ±5 Hz.

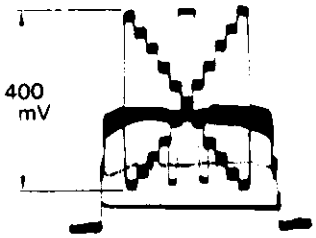
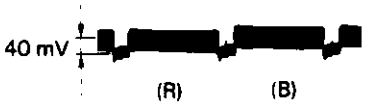


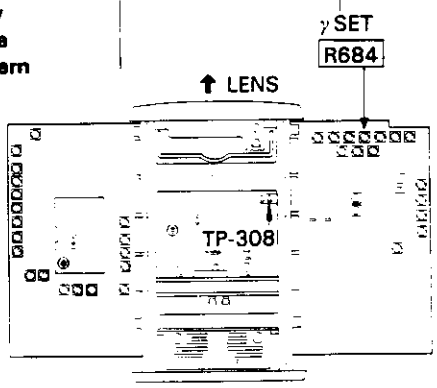
3. ADJUSTMENT OF THE SIGNAL SYSTEM

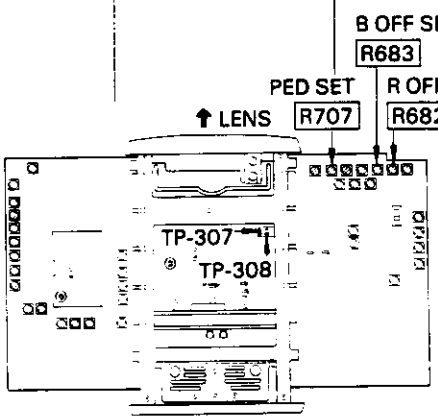
1.	**MAX GAIN Adjustment**	**DC voltmeter**	**(48) (TP-MAX)**	**R678 (AGC MAX G.)**	Adjust **R678 (AGC MAX G)** the DC voltmeter indicates **2.65V** ±**0.01V** on the scale.
2.	**WHITE BALANCE Coarse Adjustment**	**DC voltmeter**	**(49) (R CTL)** **(50) (B CTL)**	**R658 (IN-B)** **R655 (IN-R)**	1. Set the WHITE BALANCE switch to "☼" (IN-DOOR) and, while measuring the voltage at (50) with a DC voltmeter, adjust **R658 (IN-B)** so that the voltage reading is **2.85** ±**0.01 V**. 2. While measuring the voltage at (49) with the DC voltmeter, adjust **R655 (IN-R)** so that the voltage reading is **2.75** ±**0.01 V**.



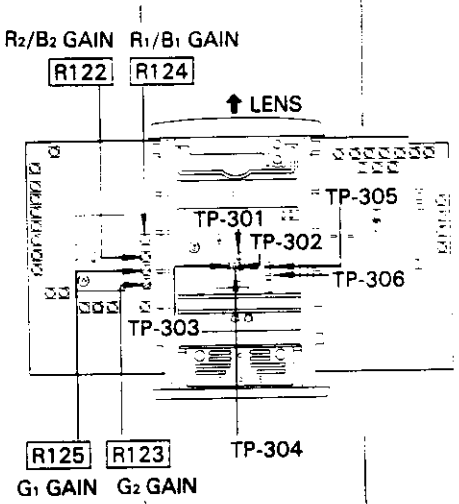
No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
3.	**IRIS SET Adjustment**	**Oscilloscope** (H-rate 10 : 1) **Gray scale pattern**	**b6 (CCD OUT)** or ② PIN of K connector  	**Iris control knob (LENS side)**	1. While observing the waveform at **b6 (CCD OUT)**, or ② Pin of K connector adjust the iris control knob so that the waveform is set at **150 ± 1mV** as shown in **Fig. 3-1**.  **Fig. 3-1** **NOTE:** Never bring **CCD OUT Pin** into contact with any other pin because the CCD imager should be damaged.
4.	**R.G.B DET Adjustment**	**Oscilloscope** (H-rate 10 : 1) **Gray scale pattern**	TP-605 (TP-G DET) TP-604 (TP-R/B DET)  	**R687 (G.GAIN)** **R680 (R GAIN)** **R679 (B GAIN)**	● Observe the waveform at **b6 (CCD OUT)** or ② Pin of K connector and make sure that the waveform is **150 ± 1mV** as shown in **Fig. 3-1**. ● **EXT TRIGGER** Apply external trigger with a signal passing through a resistance of 1 kΩ to **TP-309 (TP-ID)**. 1. Measure the waveform at **TP-605**, and adjust **R687 (G.GAIN)** so that the waveform is **300 ± 1mV** as shown in **Fig. 4-1**.  **Fig. 4-1** 2. Measure the waveform at **TP-604**, and adjust **R680 (R GAIN)** and **R679 (B GAIN)** so that each waveform is **300 ± 1mV**.  **Fig. 4-2**

No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
5.	γ Adjustment	Oscilloscope (H-rate 10 : 1) Gray scale pattern	TP-308 (T-Gγ)	R684 (γ SET)	● If the waveform is slightly collapsed or deformed, raise **R707 (PED SET)** sufficiently and release **R685 (Y KNEE)** by turning it fully counterclockwise before adjustment. This will facilitate adjustment. 1. Observe the waveform at **TP-308** and adjust **R684 (γ SET)** so that the waveform is **400 ± 3mVp-p**.  **Fig. 5-1**
6.	**PEDESTAL Adjustment**	Oscilloscope (H-rate 10 : 1)	TP-308 (TP-Gγ) TP-307 (TP-R/Bγ)	R707 (PED SET) R683 (B OFF SET) R682 (R OFF SET)	● **EXT TRIGGER** Apply external signal with a signal passing through a resistance of **1 kΩ** to **TP-309 (TP-ID)**. ● Using the lens cap, close the iris. 1. Observe the waveform at **TP-308**, and adjust **R707 (PED SET)** so that the waveform is **40 ± 2mV** (center to center) as shown in **Fig. 6-1**.  **Fig. 6-1** 2. Observe the waveform at **TP-307**, and adjust **R683 (B OFFSET)** and **R682 (R OFFSET)** so that each waveform is **40 ± 2mV** (center to center) as shown in **Fig. 6-2**.  **Fig. 6-2**





No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
7.	**OUTPUT WAVE-FORM LEVELs Adjustment**	**Dual-trace oscilloscope** **Gray Scale pattern**	**TP-301 (TP-G_0)** **TP-302 (TP-G_1)** **TP-303 (TP-G_2)** **TP-306 (TP-R_0/B_0)** **TP-305 (TP-R_1/B_1)** **TP-304 (TP-R_2/B_2)**	**R125 (G_1 GAIN)** **R123 (G_2 GAIN)** **R124 (R_1/B_1 GAIN)** **R122 (R_2/B_2 GAIN)**	● Observe the waveform at (b6) **(CCD OUT)** or pin ② of the connector [K]. Adjust the iris control knob so that the waveform is set at **150 mV** as shown in **Fig. 3-1**. 1. Connect **TP-301** to the **channel-1** side. 2. Connect **TP-302** to the **channel-2** side. Then invert one channel of the oscilloscope and set the oscilloscope to the ADD mode. Adjust **R125 (G_1 GAIN)** so that the waveform becomes linear as shown in **Fig. 7-1**. 3. Connect **TP-303** to the **channel-2** side. Then invert one channel of the oscilloscope and set the oscilloscope to the ADD mode. Adjust **R123 (G_2 GAIN)** so that the waveform becomes linear as shown in **Fig. 7-1**. 4. Connect **TP-306 to the channel-1** side. 5. Connect **TP-305** to the **channel-2** side. Then invert one channel of the oscilloscope and set the oscilloscope to the ADD mode. Adjust **R124 (R_1/B_1 GAIN)** so that the waveform becomes linear as shown in **Fig. 7-1**. 6. Connect **TP-304** to the **channel-2** side. Then invert one channel of the oscilloscope and set the oscilloscope to the ADD mode. Adjust **R122 (R_2/B_2 GAIN)** so that the waveform becomes linear as shown in **Fig. 7-1**.



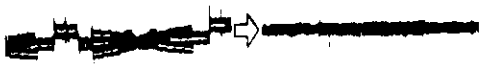
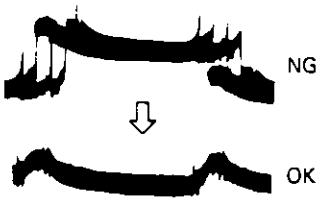
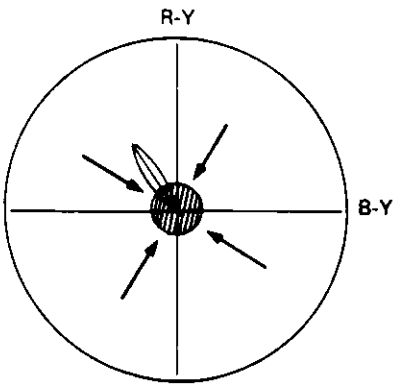
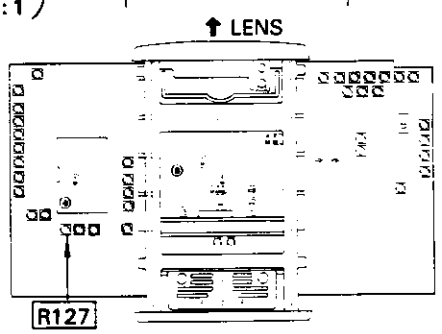
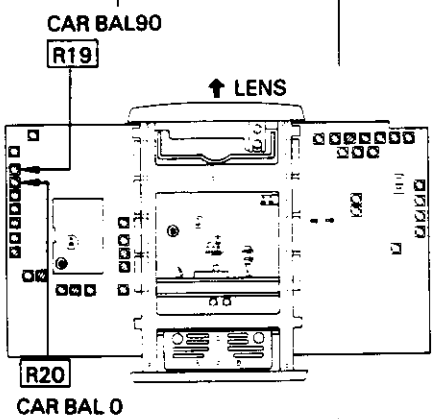


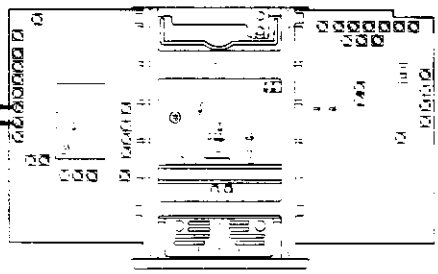
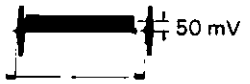
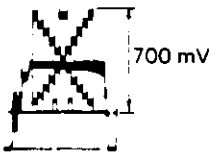
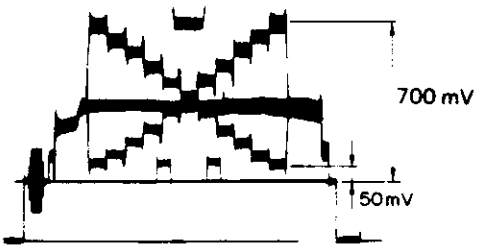
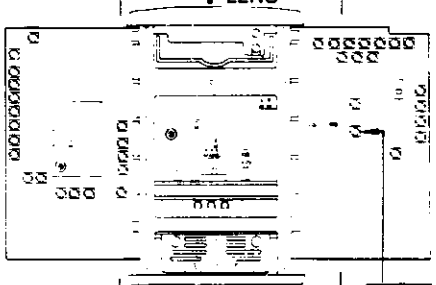
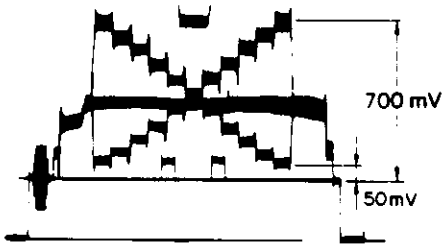
Fig. 7-1

NOTE: If a dual-trace oscilloscope is not available, adjustment should be done so that each wave form level is equal.

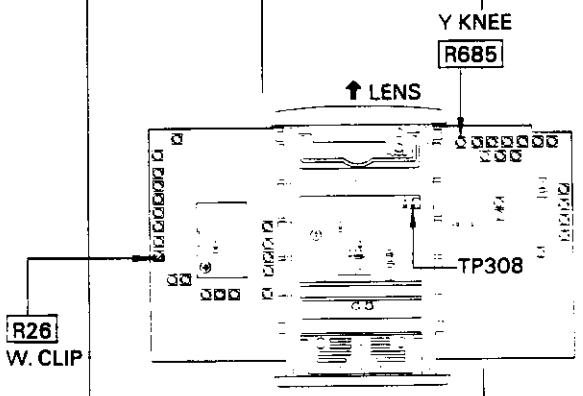
No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
8.	MPX Adjustment	Oscilloscope (H-rate 10 : 1)	(4) (R-Y)	R127 (MPX-DC)	● EXT-TRIGGER Apply external trigger to TP-309 (TP-ID), using a signal passing through a 1 kΩ resistor. 1. Measure (4) (R-Y), and adjust R127 (MPX-DC) to make the waveform linear.  Fig. 8-1
9.	CARRIER BALANCE Adjustment	Oscilloscope (H-rate 10 : 1)	VIDEO OUT	R19 (CAR BAL 90) R20 (CAR BAL 0)	Procedures of adjustment with oscilloscope ● Close the iris by applying the lens cap. 1. Measure VIDEO OUT, and adjust R19 (CAR BAL 90) and R20 (CAL BAL 0) by turns so as to minimize the carrier as seen in Fig. 9-1.  Fig. 9-1
		Vectorscope	VIDEO OUT	R19 (CAR BAL90) R20 (CAR BAL0)	Procedures of adjustment with vectorscope ● Close the iris by applying lens cap. ● Carrier can be easily adjusted at near the zero point by increasing the gain of the vectorscope. 1. Adjust R19 (CAR BAL 90) and R20 (CAR BAL 0) by turns to set the carrier at the center of the vectorscope.  Fig. 9-2





No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
10.	**Y.SET UP Adjustment**	**Oscilloscope** (**H-rate** **10 : 1**) **Gray scale pattern** Y.GAIN R29 ↑ LENS  R25 Y.SET UP	**VIDEO OUT**	**R25 (Y.SET UP)** **R29 (Y GAIN)**	● If the top of the waveform may be clipped turn **R685 (Y KNEE)** and **R26 (W CLIP)** until the waveform will not surpress. 1. Close the iris by applying the lens cap. 2. Measure VIDEO OUT, and adjust **R25 (Y. SET UP)** so that the waveform becomes **50 ± 2mV** as shown in **Fig. 10-1**.  50 mV **Fig. 10-1** 3. Remove the lens cap. 4. Observe the waveform at (b6) **(CCD OUT)**, or ② Pin of K connector and make sure that the waveform is **150 ± 5mV** as shown in **Fig. 3-1**. 5. Measure VIDEO OUT, and adjust **R29 (Y GAIN)** so that the waveform become **700 mV** as shown in **Fig. 10-2**.  700 mV **Fig. 10-2** 6. Repeat steps 1 and 2 so that the level of the waveform at VIDEO OUT becomes that shown in **Fig. 10-3**.  700 mV 50mV **Fig. 10-3**
11.	**AUTO IRIS SET Adjustment**	**Oscilloscope** (**H-rate** **10 : 1**) **Gray Scale pattern** ↑ LENS  R614 AUTO IRIS	**VIDEO OUT**	**R614 (AUTO IRIS)**	● Connect the auto iris connector of the lens side to the auto iris connector of the camera. 1. Adjust **R614** (AUTO IRIS) so that the waveform present at the video out jack be comes **700 mV** as shown in **Fig. 11-1**. **NOTE:** This adjustment can be applied only to the lens having an auto iris function.  700 mV 50mV **Fig. 11-1**

No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
12.	**Y KNEE Adjustment**	**Oscilloscope** (**H-rate 10 : 1**) **Gray scale pattern**	**TP-308 (TP-Gγ)**	**R685 (Y KNEE)**	● Turn **R26 (W CLIP)** fully counterclockwise to release them. 1. Open the iris sufficiently. 2. Measure **TP-308**, and adjust **R685 (Y KNEE)** so that the peak level of the waveform is set at **600 mV ± 5 mV**.
13.	**WHITE CLIP Adjustment**	**Oscilloscope** (**H-rate 10 : 1**) **Gray scale pattern**	**VIDEO OUT**	**R26 (W CLIP)**	1. Open the iris sufficiently. 2. Adjust **R26 (W CLIP)** so that the clip point of the waveform at VIDEO OUT becomes **770 ± 5mV** as shown in **Fig. 12-1**.



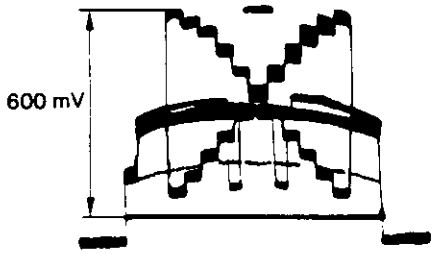
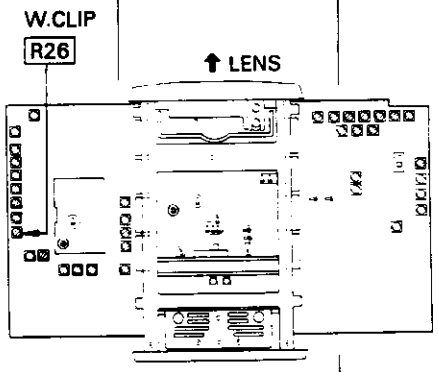


Fig. 12-1



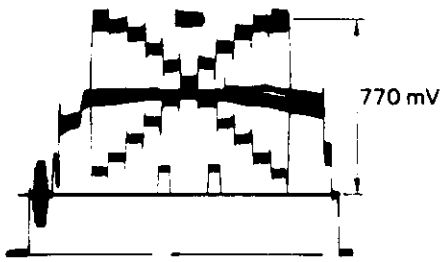
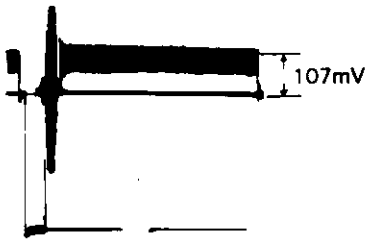
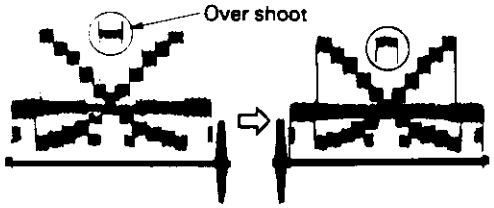
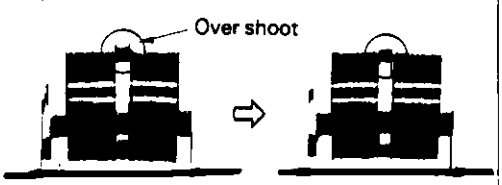
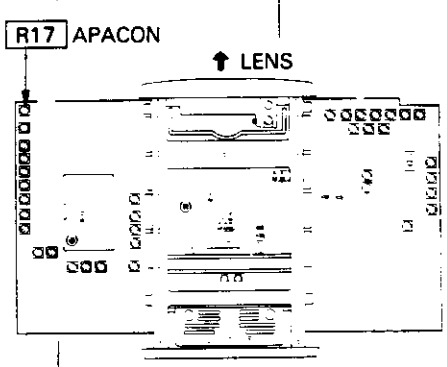


Fig. 13-1

No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
14. a.	**AGC Adjustment** **AGC SET Adjustment**	**Oscilloscope** (H-rate 10 : 1) **Gray scale pattern** AGC Y.SET UP R138 R140 AGC V.CONTOUR	**VIDEO OUT** AGC APACON R139 AGC SET R634	**R634 (AGC SET)**	1. Adjust the iris control knob (lens side) so that the VIDEO OUT level is **490 mV (70 IRE)**.  **Fig. 14-1** 2. Set the AGC switch to ON and adjust **R634 (AGC SET)** so that the VIDEO OUT level is **510 ± 10 mV**.
b.	**AGC Depender Adjustment**	**Osilloscope** **Gray scale pattern**	**VIDEO OUT**	**R138 (AGC Y SET UP)** **R139 (AGC APACON)** **R140 (AGC V.CONTOUR)**	● Close the iris. AGC switch: ON 1. Adjust **R138 (AGC Y.SET UP)** so that the SET UP is **107 mV (15 IRE)**.  **Fig. 14-2** ● Remove the lens cap. 2. Adjust the iris control knob (lens side) so that the VIDEO OUT level is **357 mV (50 IRE)**. 3. Adjust **R139 (AGC APACON)** so that the over shoot (H-rate) of the VIDEO OUT waveform is aligned with the top of the white peak waveform.  **Fig. 14-3** 4. Adjust **R140 (AGC V.CONTOUR)** so that the over shoot (V-rate) of the VIDEO OUT waveform is aligned with the top of the white peak waveform.  **Fig. 14-4**

No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
15.	**APACON Adjustment**	**Oscilloscope** (**H-rate** 10 : 1) **Gray scale pattern**	**VIDEO OUT**	**R17 (APACON)**	1. Adjust the iris control knob (lens side) so that the VIDEO OUT output is **560 mV (80 IRE)**. ● At that time, the focus should be adjusted precisely. If the focus is not aligned, the overshoot cannot be measured correctly. 2. Adjust **R17 (APACON)** so that overshoot is **107 ± 35mV (15 ± 5 IRE)** as shown in **Fig. 15-1**.
16.	**SYNC LEVEL Adjustment**	**Oscilloscope** (**H-rate** 10 : 1)	**VIDEO OUT**	**R85 (SYNC.LEVEL)**	1. Close the iris by applying the lens cap. Adjust **R85 (SYNC. LEVEL)** so that the sync level is set at **0.3 Vp-p** as shown in **Fig. 16-1**.



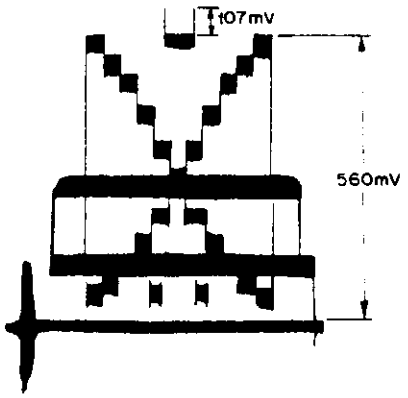
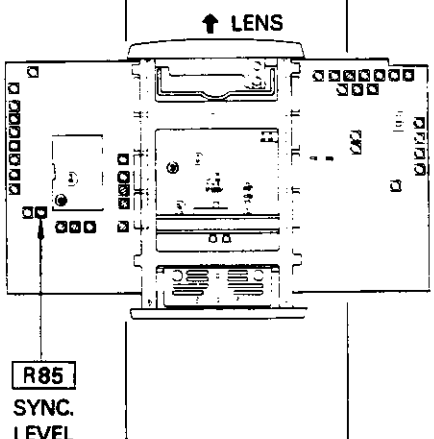


Fig. 15-1



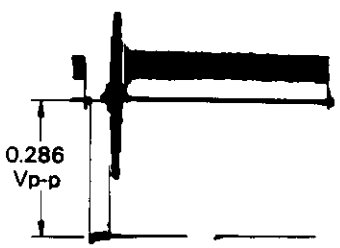


Fig. 16-1

No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
17.	**BURST LEVEL Adjustment**	**Vectorscope**	VIDEO OUT	**R21 (BURST GAIN)** **R22 (HUE)**	● Close the iris by applying the lens cap. 1. Adjust **R22 (HUE)** so that the BURST becomes PAL BURST POSITION. 2. Adjust **R21 (BURST GAIN)** so that the BURST LEVEL is set at the **75%** shown in **Fig. 17-1**.

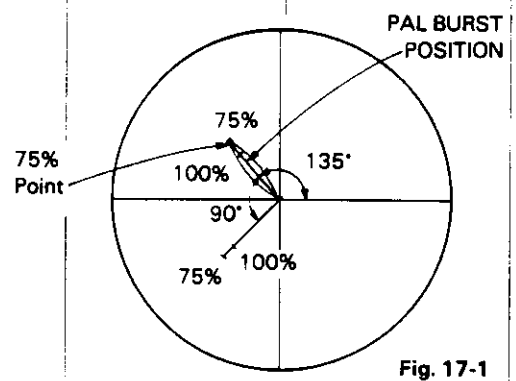
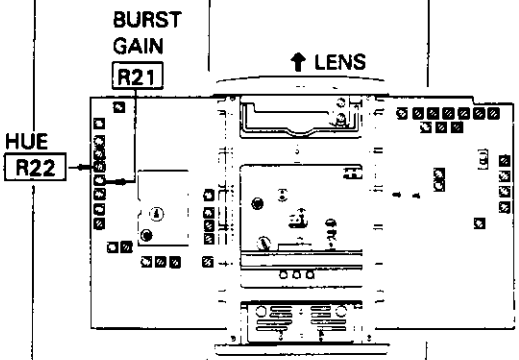


Fig. 17-1



Notes
1. The **BURST POSITION** adjustment can only be performed with a vectorscope.
2. A rough adjustment of BURST GAIN is possible also with an oscilloscope.

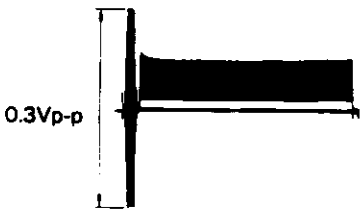


Fig. 17-2

No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
18.	**IN-DOOR WHITE BALANCE Adjustment**	**Oscilloscope** (**H-rate** 10 : 1) **Gray scale pattern**	**VIDEO OUT**	**R679 (B GAIN)** **R680 (R GAIN)**	● Perform this adjustment only when the white balance is found to be abnormal when the gray scale is displayed. Procedures of adjustment with oscilloscope 1. Adjust **R680 (R GAIN)** and **R679 (B GAIN)** by turns so that the carrier becomes minimum. (See **Fig. 18-1.**)
		Vectorscope **Gray scale pattern**	**VIDEO OUT**	**R679 (B GAIN)** **R680 (R GAIN)**	Procedures of adjustment with vector scale ● Adjustment can be easily made near the zero point by increasing the gain of the vectors cope. 1. Adjust **R680 (R GAIN)** and **R679 (B GAIN)** by turns so that the carriers set minimum and at the center of the vectorscope as shown in **Fig. 18-2.**

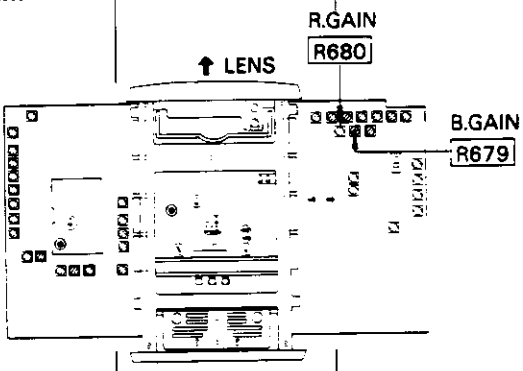


Fig. 18-1

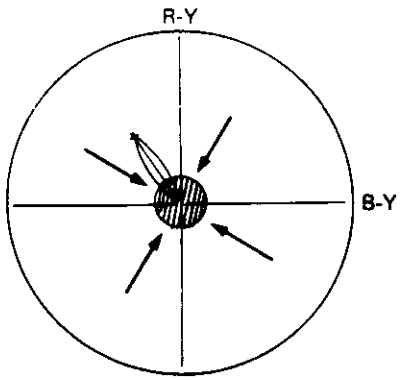
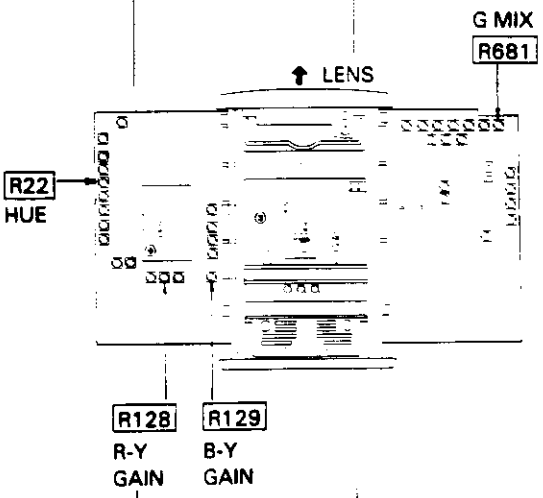


Fig. 18-2

No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
19.	COLOUR RE-PRODUC-TION Adjustment	Vectorscope Colour bar pattern (CC-2T) Monitor TV	VIDEO OUT	R128 (R-Y GAIN) R129 (B-Y GAIN) R681 (G MIX)	1. Display the colour bar pattern, and see that the white portion is set at 0.7 VWD-PD. 2. Adjust **R128 (R-Y GAIN)** so that the red portion is put to **(A)** as shown in **Fig. 19-1**. Adjust **R129 (B-Y GAIN)** so that the yellow level is put to **(B)** as shown in **Fig. 19-1**. **NOTE:** If no vectorscope is available, adjust **R129 (B-Y GAIN)** and **R128 (R-Y GAIN)** so that optimum colour reproducibility is obtained, while observing the colour bar pattern displayed on the monitor TV. 3. Adjust **R681 (G MIX)** and minimize the crawling displayed on the monitor TV. (Like a state of non interless)



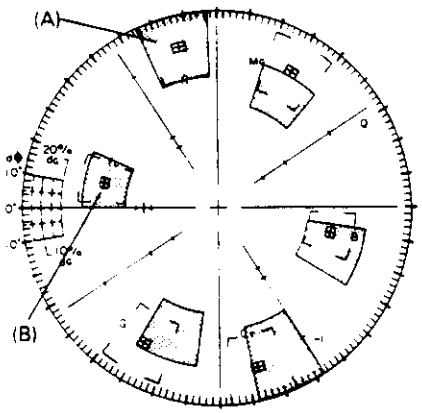
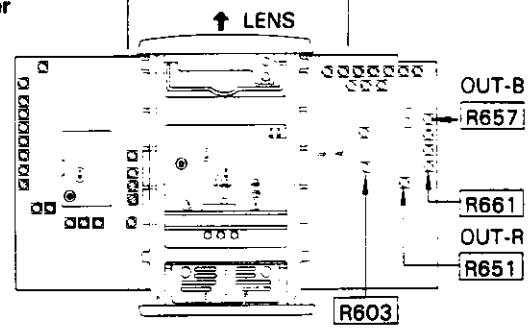


Fig. 19-1

No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
20.	**OUT DOOR WHITE BALANCE Adjustment**	**Oscilloscope** (H-rate 10 : 1) **Gray scale Pattern** **80C + CC10C + CC10B Filter or equiv alent, 1 filter**	**VIDEO OUT**	**R657 (OUT-B)** **R661 (OUT-R)**	Procedures of adjustment with oscilloscope 1. Mount **Filter** on the lens, and set the white balance SW to " ☼ " (OUT-DOOR). 2. Adjust **R657 (OUT-B)** and **R661 (OUT-R)** by turns so that the carrier for the waveform may be minimized. (See **Fig. 20-1**.)
		Vectorscope	**VIDEO OUT**	**R657 (OUT-B)** **R661 (OUT-R)**	Procedures of adjustment with the vectorscope 1. Attach the on the lens, and set the white balance control to " ☼ " (OUT-DOOR) position. 2. Alternately adjust the **R657 (OUT-B)** and **R661 (OUT-R)** so that the carrier is located at the center of the vectorscope.
21.	**IRIS VIDEO LEVEL** **IRIS SYNC LEVEL**	**Oscilloscope** **Gray scale Pattern**	**Pin ② (Video) of Rear IRIS terminal**	**R603 (IRIS VIDEO LEVEL)** **R651 (IRIS SYNC LEVEL)**	1. Measure voltage at pin ② of rear IRIS terminal and adjust **R603 (IRIS VIDEO LEVEL)** so that the voltage at pin ② is 700 mV. 2. Adjust **R651 (IRIS SYNC LEVEL)** so that the SYNC level is 300 mV.



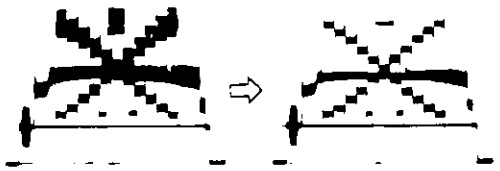


Fig. 20-1

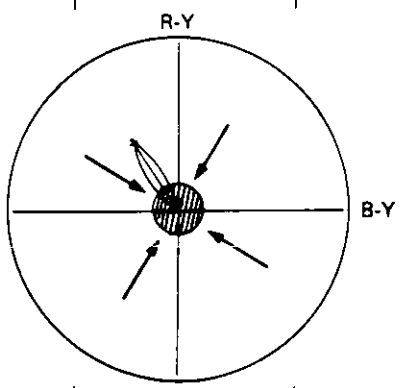
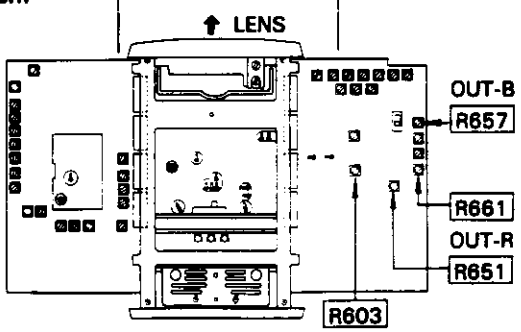
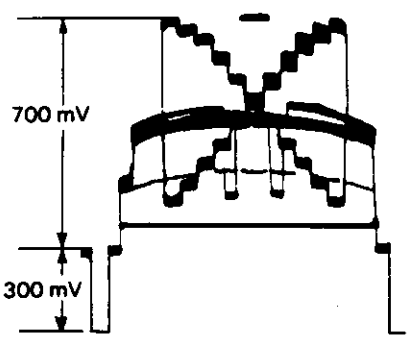
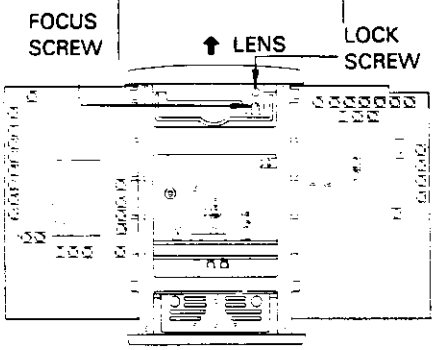


Fig. 20-2





No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
22.	BACK FOCUS Adjustment	Monitor TV Siemens chart, resolution chart, or subject with clear white and black stripes	VIDEO OUT	LOCK SCREW FOCUS SCREW	● It is not necessary to remove the cover before this adjustment. ● Under a relatively dark illumination, open the lens iris. 1. Place the Siemens chart at a position 3 meter or more apart from the camera. (Place the chart as far as possible from the camera.) 2. Set the camera zooming to the telephoto end and focus the chart. After focusing, slowly turn the zoom ring toward the wide-angle end and make sure that the object is always focused correctly. 3. If focusing varies, loosen the lock screw and turn the focus screw for optimum focusing. 4. Repeat steps 2 and 3 until focusing becomes always optimum. 5. When the optimum backfocusing is obtained, tighten the lock screw.
23.	FINAL CHECK	Vectorscope Oscilloscope Colour bar pattern Gray scale pattern Coloured subject etc.	VIDEO OUT		1. Shoot the colour bar pattern in the auto iris mode and make sure that the colour carriers are located as indicated in **Fig. 23-1**. (only for the lens with auto iris function) 2. Manipulate the white balance switch, and other switches to see that they work normally. 3. Shoot the gray scale pattern and check γ, WHITE BALANCE, Y SETUP, etc. at VIDEO OUT. 4. Shoot an appropriate subject and check colors, reproducibility and other functions of the camera. 5. If results of check are unsatisfactory, repeat the steps for adjustment as appropriate.



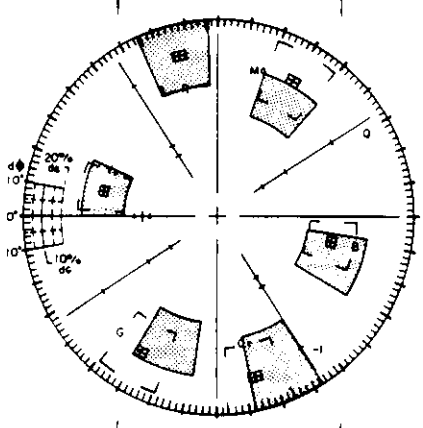
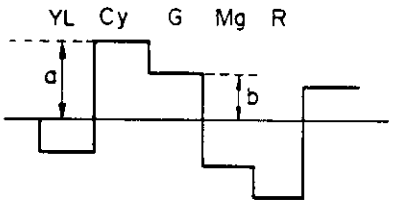
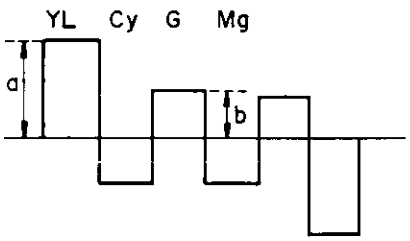
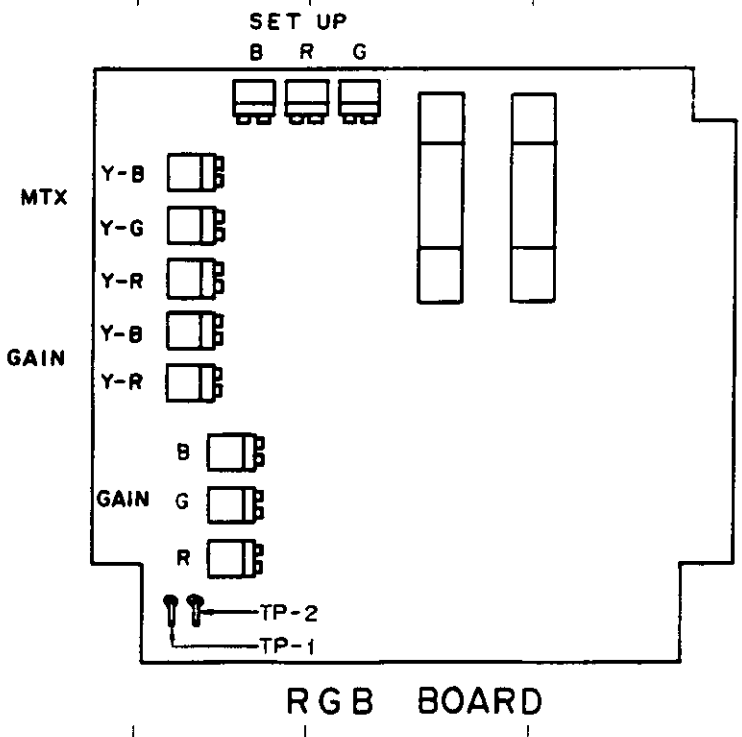


Fig. 23-1

4. ADJUSTMENTS OF RGB CIRCUIT

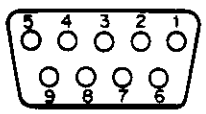
Proceed to this adjustment only after having completed the adjustments of the power supply, SSG and signal system.

No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
1.	Chroma Difference Adjustment	Oscilloscope (H-rate) (10 : 1) Colorbar Pattern	VIDEO OUT TP-1 R-Y (Main Board C Block)	Y-R (MTX)	● Adjust the IRIS control (on the lens) to set the level of the VIDEO OUT waveform at 0.7 V_{WD-PD}. 1. While observing the waveforms at TP-1 and at R-Y in the C Block of the Main Board, adjust the Y-R (MTX) potentiometer so that the level relation at TP-1 is equal to the level ratio at R-Y in the C Block.
					
					Align a : b with the ratio at R-Y in the C Block. **Fig. 4-1**
			TP-2 B-Y (Main Board C Block)	Y-B (MTX)	2. While observing the waveforms at TP-2 and at B-Y in the C Block of the Main Board, adjust the Y-B (MTX) potentiometer so that the level relation at TP-2 is equal to the level ratio at B-Y in the C Block.
					
					Align a : b with the ratio at B-Y in the C Block. **Fig. 4-2**



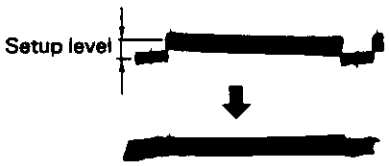
No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
2.	**Chroma Difference Signal Gain Adjustment**	**Oscilloscope** (H-rate 10 : 1) (DC range) **Colourbar Pattern**	**VIDEO OUT**		● Adjust the IRIS control (on the lens) to set the level of the VIDEO OUT waveform at **0.7 VWD-PD**.
			R-OUT	**Y-R (GAIN)**	1. While measuring R-OUT, adjust the Y-R (GAIN) potentiometer to align the level of Mg with the W level.
					Fig. 4-2 (a)
			B-OUT	**Y-B (GAIN)** **Y-B (MTX)**	2. Turn the Y-B (GAIN) potentiometer clockwise until just before the waveform is disordered. 3. Adjust the Y-B (MTX) potentiometer to set the level of Mg at approx. 83% of Cy.
					Fig. 4-2 (b)
			G-OUT	**Y-G (MTX)**	4. While measuring G-OUT, adjust the Y-G (MTX) potentiometer to set the level of G at approx. 83% of YL.
					Fig. 4-2 (c)

■ **R/G/B, REF/VIDEO OUT connectors**
For the R/G/B, ref. and video signal outputs.



Pin No.	1	2	3	4
Terminal Name	GND (MAIN)	GND (COMP./VIDEO./SYNC.)	R-OUT	G-OUT

5	6	7	8	9
B-OUT	COMP. VIDEO OUT	COMP. SYNC OUT	GND	GND

No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
3.	**RGB Gain Setup Adjustment**	**Oscilloscope** (H-rate 10 : 1) **Gray scale pattern**	**R-OUT**	**R (GAIN)** **R (SET UP)**	● AGC Switch OFF. ● Adjust the IRIS control (on the lens) to set the level of the VIDEO OUT waveform at **700 mV**PD-WP. 1. While measuring R-OUT, adjust the R (GAIN) potentiometer to set the amplitude from black to white to **650 mV** . (Fig. 4-3 (a))  **Fig. 4-3 (a)** 2. Cap the lens to block the light incident to the iris. 3. Adjust the R (SET UP) potentiometer to make the setup level waveform flat (0 V) as shown in Fig. 4-3 (b).  **Fig. 4-3 (b)** 4. Remove the cap from the lens and check that the voltage difference between the blanking and white-peak levels is 700 mV. If not, adjust the R (GAIN) potentiometer for 700 mV and check the setup level again.
			 **Fig. 4-3 (c)**		
			B-OUT	**B (GAIN)** **B (SET UP)**	Use the same procedure as the R-OUT adjustment.
			G-OUT	**G (GAIN)** **G (SET UP)**	Use the same procedure as the R-OUT adjustment. **NOTE:** Adjust so that each RGB output becomes the same gain.

No.	Item	Measuring instrument & pattern	Test point	Adjustment part	Description
4.	Confirmation	RGB monitor			● If an RGB monitor is available, confirm the adjustment result with the following procedure. 1. Compare the RGB output and VIDEO output to check that they have similar hues. 2. When the hues are different noticeably, perform the adjustments of the RGB circuit again.

3. PARTS LIST

IMPORTANT SAFETY NOTICE:

Components identified by the ⚠ symbol in this parts information have special characteristics for safety.
These critical safety components are designed to "fail safe" under abnormal conditions. The failure of any one component often causes stress in other components which could lead to smoke or fire or other hazards. Because of this, components are selected and tested under actual fault conditions to ensure safe operation. Replacement with anything other than the identical JVC part may present a hazard.

NOTE 1 SUPPLY OF PARTS WITHOUT PARTS NO.

The parts indicated with —— in the Part No. column will not be supplied.

NOTE 2 SUPPLY OF CH MG R AND CH C CAP.

Chip Metal Glaze Resistor (CH MG R) and Chip Ceramic Capacitor (CH C Cap.) will not be supplied as follows, and are not generally described in the Printed Circuit Board parts list.

Chip Metal Glaze Resistor (CH MG R)			Chip Ceramic Capacitor (CH C Cap.)		
Parts Number	Rated Power	Tolerance	Parts Number	Rated Voltage	Tolerance
QRS148J-	1/4W	J	QCS81HJ-	50V	J
QRSA08J-	1/10W	J	QCT81CH-	50V	J
QRSA08G-	1/10W	G	QCT81UJ-	50V	J
			QCF81HZ-	50V	Z
			QCY81HK-	50V	K
			QCY81EK-	25V	K
			QCF81EZ-	25V	Z

NOTE 3 DECODING OF RESISTOR, CAPACITOR AND TOLERANCE

RESISTOR
All resistance values in ohms
K: 1000 M: 1000000

C R	Carbon Resistor
CH VR	Chip Variable Resistor
CMF R	Coating Metal Film Resistor
Comp. R	Composition Resistor
F R	Fusible Resistor
HV R	High Voltage Resistor
LPTC R	Linear Positive Temperature Coefficient Resistor
MF R	Metal Film Resistor
MG R	Metal Glaze Resistor
OM R	Oxide Metal Film Resistor
P R	Plate Resistor
UNF R	Nonflammable Resistor
V R	Variable Resistor

CAPACITOR
Capacitance values in pF or in μF

BP E Cap.	Bi-Polar (or Non-Polar) Electrolytic Capacitor
C Cap.	Ceramic Capacitor
CH Tan. E Cap.	Chip Tantalum Electrolytic Capacitor
E Cap.	Electrolytic Capacitor
M Cap.	Mylar Capacitor
MM Cap.	Metalized Mylar Capacitor
MP Cap.	Metalized Polystyrol Capacitor
MPP Cap.	Metalized PP Capacitor
PP Cap.	Polypropylene Capacitor
PS Cap.	Polystyrol Capacitor
Tan. Cap.	Tantalum Capacitor
CH AL BP Cap.	Chip Aluminum Bi-Polar Capacitor
CH AL BP E Cap.	Chip Aluminum Bi-Polar Electrolytic Capacitor
CH AL E Cap.	Chip Aluminum Electrolytic Capacitor

TOLERANCE

F	±1%	H	+50 −10 %
G	±2%		
J	±5%	P	+100 −0 %
K	±10%		
M	±20%	R	+30 −10 %
N	±30%		
		Z	+80 −20 %

NOTE 4 MARKING FOR THE PARTS THAT ARE STATIC SENSITIVE

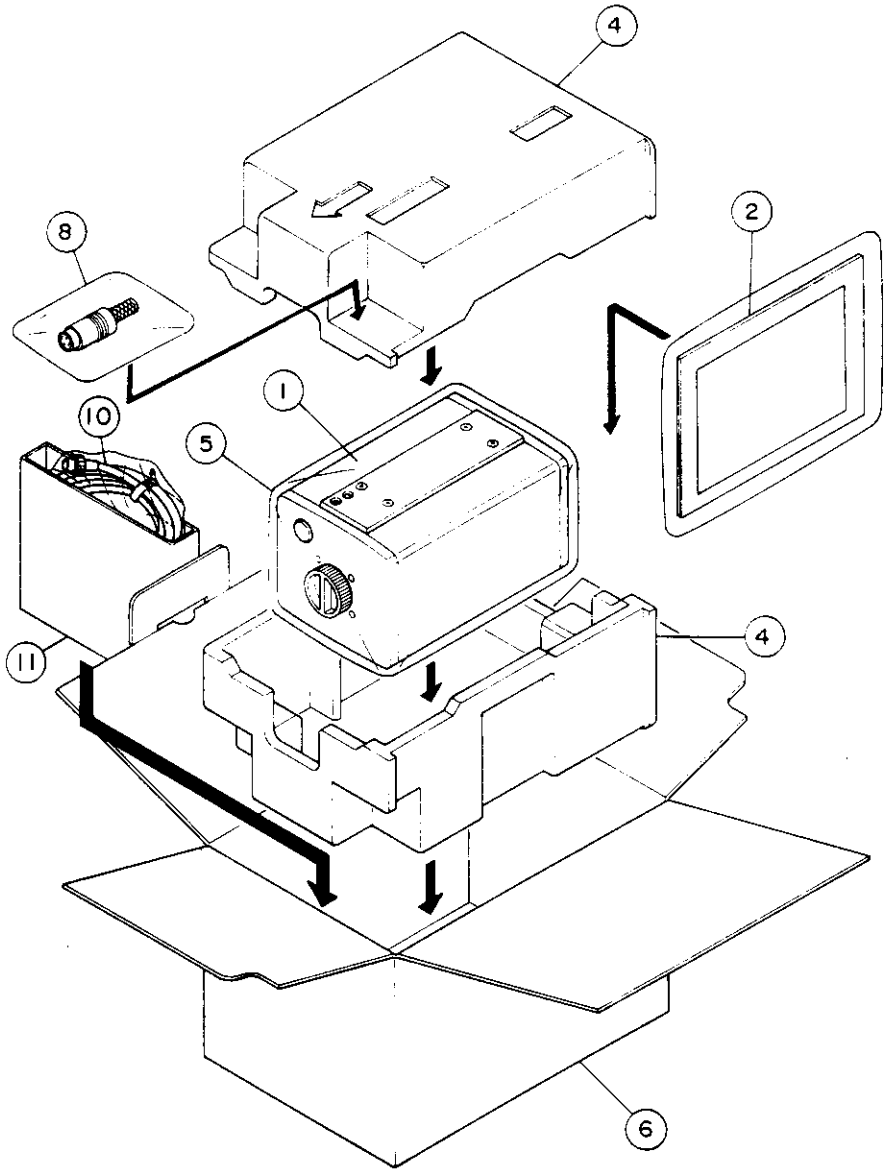
The parts with the SS or S marking, shown below, are susceptible to static electricity. Therefore, care should be taken when servicing them.
Be particularly very careful with the parts having the SS marking.

S : Those parts that need care are already installed; perform normal servicing for ass'y.
SS : Be very careful.
Unmarked : Normal servicing

NOTE 5 MARKING FOR THE PARTS THAT NEED CARE WHEN TRANSPORTING OR STORING THEM

When transporting or storing them, avoid strong sunlight, dust, dirt, cracking, shortened life etc. These parts are indicated by a SK marking.

■ PACKING

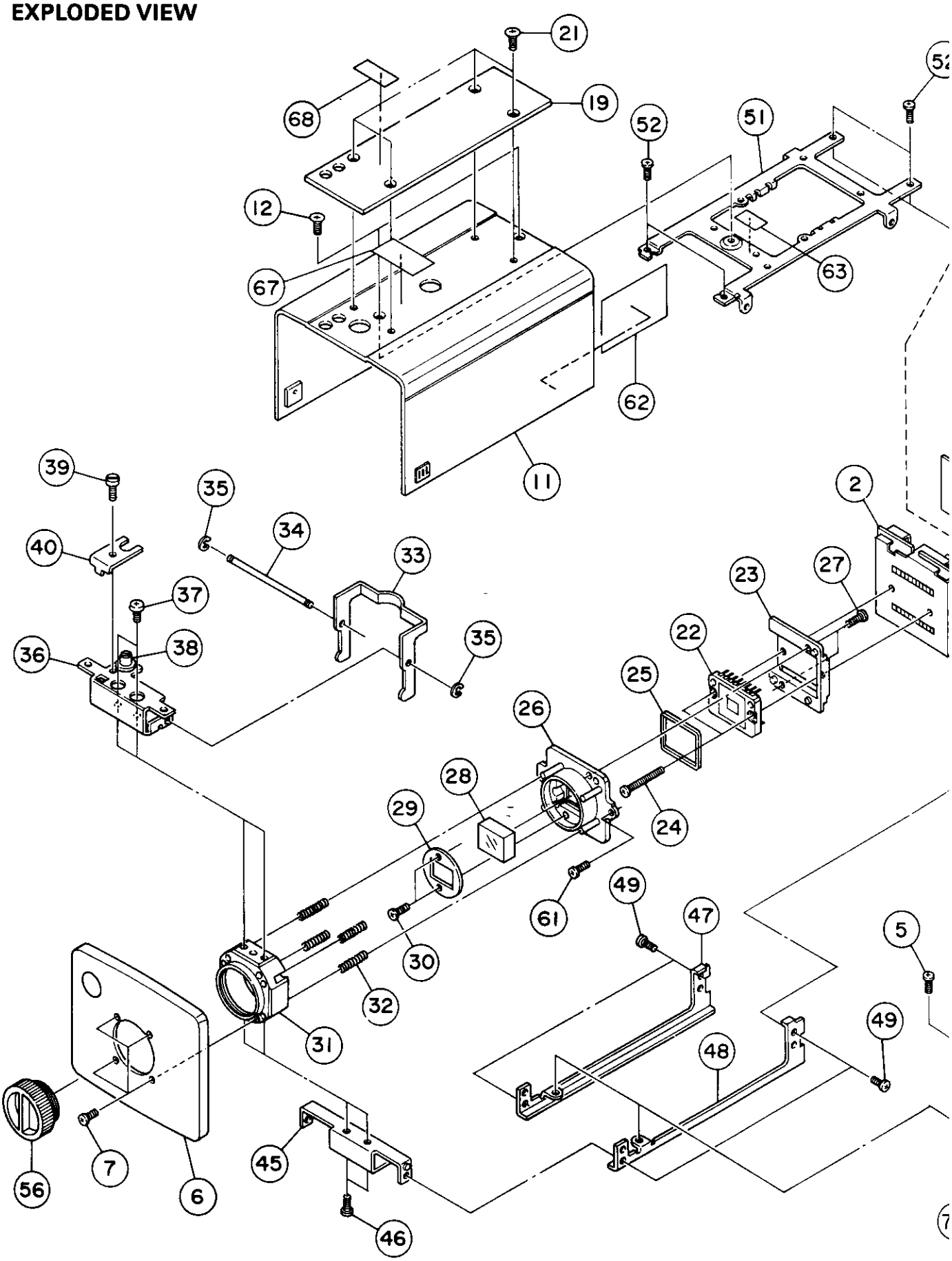


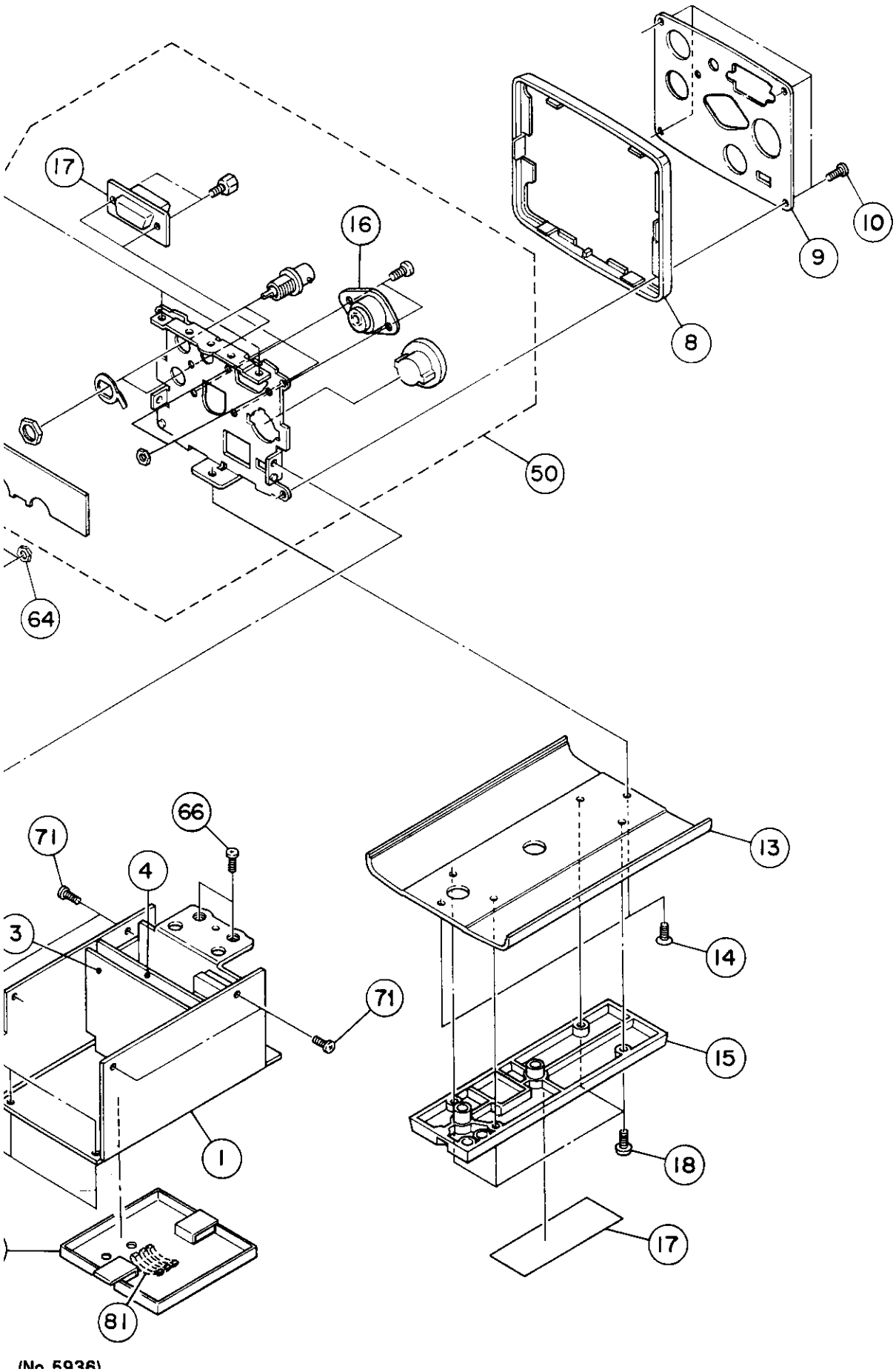
■ PACKING PARTS LIST

M 2 M M

SYMBOL NO.	PART NO.	PART NAME	REMARKS
1	————	CAMERA BODY	TK-870E
2	TK-870E-IB-A	INST BOOK	
4	CP20245-A0A	CUSHION	
5	CP30004-031	POLY. BAG	
6	CP20228-022	PACKING CASE	
8	CE41155-001	IRIS PLUG	
10	VC-450-2E	CABLE	
11	CP40190-001	SLEEVE	

■ EXPLODED VIEW





(No. 5936)

■ SYSTEM ASSEMBLY REPLACEMENT PARTS LIST

M1MM

SYMBOL NO.	PART NO.	PART NAME	REMARKS
⚠ 1	————	MAIN BOARD	CAW-1520A S. SK
⚠ 2	CAW-A012A	IMAGER BOARD	S. SK
⚠ 3	CAW-8511A	GEN-LOCK BOARD	S. SK
⚠ 4	CAW-4511A	RGB BOARD	S. SK
5	SPSK2040R	MINI SCREW	(×2)
⚠ 6	CM21094-003-M0	FRONT COVER	
7	SPSK2040R	MINI SCREW	(×4)
⚠ 8	CM21095-B01-M0	REAR COVER	
⚠ 9	CM32199-008	REAR PLATE	
10	SPSK2040R	MINI SCREW	(×4)
⚠ 11	CM21097-00A	TOP COVER ASSY	
12	SSEP2606	SCREW	(×2)
⚠ 13	CM21098-001	BOTTOM COVER	
14	SSEP2606	SCREW	(×2)
⚠ 15	CM21096-B0A	TRI-BASE ASSY	
17	CM32196-003 (R)	ROLL N LABEL	
18	SHSP2606R	SCREW	(×4)
⚠ 19	CM32188-A01	TOP PLATE	
21	SHSP2606R	SCREW	(×4)
⚠ 22	ICX021-K	CCD IMAGER	SS. SK
23	CM31968-A01	IMAGER HOLDER	
24	CM44002-001	MINI SCREW	(×2)
25	CM43691-001	I RUBBER	SK
26	CM32190-B0A	ADJUSTRING ASSY	
27	SPSK2050M	MINI SCREW	(×2)
28	CE41085-00B	L. P. FILTER	SK
29	CM44177-001	FILTER HOLDER	
30	SSSK2040M	MINI SCREW	(×2)
31	CM32189-A02	C MOUNT	
32	CM43994-001	ADJUST SPRING	(×4)
33	CM43995-001	ADJUST ARM	
34	CM43991-001	SHAFT	
35	REE2000	E RING	(×2)
36	CM32191-00A	ADJUST BKT	
37	SDSP2604Z	SCREW	(×2)
38	CM43993-002	ECCENTRIC ROD	
39	SPSX2608Z	PM SCREW	
40	CM43996-001	LOCK PLATE	
45	CM32193-001	FRONT BKT	
46	SPSK2040R	MINI SCREW	(×2)
47	CM32195-001	BTM BEAM	
48	CM32195-002	BTM BEAM	
49	SPSK2040R	MINI SCREW	(×4)
⚠ 50	CM21099-B0F	TERMINAL ASSY	in No. 50-1-50-17
50-10	QVAA004-CB54A	V R	TINT
50-16	CE41255-001	DIN SOCKET	
50-17	CH40326-009SN	D SUB 9S	
51	CM32194-A01	TOP BEAM	
52	SPSK2040R	MINI SCREW	(×4)
56	CM40016-001	DUST COVER	
61	SPSP2604Z	SCREW	
62	CM44152-001	CAUTION LABEL	
63	C41708	LABEL	
64	NNS2000Z	NUT	(×2)
66	SPSK2040R	MINI SCREW	(×2)
67	CM44161-A01	PHASE LABEL	
68	CM44221-001	PHASE ADJ. LABEL	
71	SPSK2040R	MINI SCREW	(×4)
72	CM32184-B01	SHIELD CASE-FR	
81	CM44314-001	EARTH SPRING	

■ PRINTED CIRCUIT BOARD PARTS LIST

10

1. CAW-1520A MAIN BOARD

SYMBOL NO.	PART NO.	PART NAME	REMARKS
VARIABLE R			
R1017	CE40150-103WA	CH V R	10KΩ APACON
R1019	CE40412-103WYA	CH V R	10KΩ CAR BAL 90°
R1020	CE40412-103WYA	CH V R	10kΩ CAR BAL 0°
R1021	CE40412-103WYA	CH V R	10kΩ BURST GAIN
R1022	CE40412-103WYA	CH V R	10kΩ HUE
R1025	CE40412-103WYA	CH V R	10kΩ Y SET UP
R1026	CE40150-103WA	CH V R	10kΩ W CLIP
R1029	CE40150-103WA	CH V R	10kΩ Y GAIN
R1085	CE40150-472WA	CH V R	4.7kΩ SYNC. L
R1122	CE40150-103WA	CH V R	10kΩ R2/B2 GAIN
R1123	CE40150-103WA	CH V R	10kΩ G2 GAIN
R1124	CE40150-103WA	CH V R	10kΩ R1/B1 GAIN
R1125	CE40150-103WA	CH V R	10kΩ G1 GAIN
R1127	CE40412-103WYA	CH V R	10kΩ MPX-DC
R1128	CE40150-103WA	CH V R	10kΩ R-Y GAIN
R1129	CE40150-103WA	CH V R	10kΩ B-Y GAIN
R1138	CE40150-474WA	CH V R	470kΩ AGC Y. SET UP
R1139	CE40150-104WA	CH V R	100kΩ AGC APACON
R1140	CE40150-474WA	CH V. R	470kΩ AGC V. CONTOUR
R1503	CE40848-472YA	CH V R	4.7KΩ 8.5V ADJ
R1603	CE40412-103XYA	CH V R	10KΩ IRIS VIDEO LE
R1634	CE40150-331XA	CH V R	330 Ω AGC SET
R1651	CE40150-103XA	CH V. R	10kΩ IRIS SYNC. L
R1655	CE40150-223XA	CH V R	22kΩ IN-R
R1657	CE40150-223XA	CH V R	22kΩ OUT-B
R1658	CE40150-223XA	CH V R	22kΩ IN-B
R1661	CE40150-223XA	CH V R	22kΩ OUT-R
R1678	CE40150-103XA	CH V R	10kΩ AGC MAX. G
R1679	CE40150-103XA	CH V R	10kΩ B GAIN
R1680	CE40150-103XA	CH V R	10kΩ R GAIN
R1681	CE40412-103XYA	CH V R	10KΩ G MIX
R1682	CE40412-103XYA	CH V R	10KΩ R OFF SET
R1683	CE40412-103XYA	CH V R	10kΩ B OFF SET
R1684	CE40150-103XA	CH V R	10kΩ γ SET
R1685	CE40150-223XA	CH V R	22kΩ Y. KNEE
R1687	CE40150-103XA	CH V R	10kΩ G GAIN
R1707	CE40150-223XA	CH V R	22kΩ PED SET
RESISTOR			
R1143	QRD161J-683	C R	68kΩ 1/6W J
R1144	QRD161J-333Y	C R	33kΩ 1/6W J
R1146	QRD161J-821	C R	820 Ω 1/6W J
R1316	QRD161J-271	C R	270 Ω 1/6W J
R1403	QRD161J-103	C R	10kΩ 1/6W J
R1404	QRD161J-473	C R	47kΩ 1/6W J
R1517	QRD161J-1R5	C R	
R1612	QRD161J-473	C R	47kΩ 1/6W J
CAPACITOR			
C1003	NEA11CM-106RZ	CHIP AL E CAP.	10μF 16V M
C1008	NEA11CM-106RZ	CHIP AL E CAP.	10μF 16V M
C1010	NEA11EM-336RP	CHIP AL E CAP.	33μF 25V M
C1011	NEA11CM-106RZ	CHIP AL E CAP.	10μF 16V M
C1012	NEA11CM-106RZ	CHIP AL E CAP.	10μF 16V M
C1014	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
C1017	NEE11CM-106RU	CHIP TAN E CAP.	10μF 16V M
C1025	QAT3110-300A	TRIMMER CAP	
C1026	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
C1028	NEE11VM-105RZ	CHIP TAN E CAP.	1μF 35V M
C1031	NEE11CM-106RU	CHIP TAN E CAP.	10μF 16V M

SYMBOL NO.	PART NO.	PART NAME	REMARKS		
CAPACITOR					
C1033	NEA11CM-106RZ	CHIP AL E CAP.	10μF	16V	M
C1036	NEA11CM-106RZ	CHIP AL E CAP.	10μF	16V	M
C1037	NEE11CM-106RU	CHIP TAN E CAP.	10μF	16V	M
C1039	NEE11CM-106RZ	CHIP TAN E CAP.	10μF	16V	M
C1120	NEE21CM-105RS	CHIP TAN E CAP.	1μF	16V	M
C1202	QEPA1HM-105M	BP E CAP.	1μF	50V	M
C1301	NEE11CM-226RZ	CHIP TAN E CAP.	22μF	16V	M
C1304	NEE11CM-106RZ	CHIP TAN E CAP.	10μF	16V	M
C1311	NEE11AM-336RZ	CHIP TAN E CAP.	33μF	10V	M
C1315	NEE11CM-106RU	CHIP TAN E CAP.	10μF	16V	M
C1317	QEE41CK-336M	TAN. CAP.	33μF	16V	K
C1318	QEE41CK-336M	TAN. CAP.	33μF	16V	K
C1320	NEE11CM-106RZ	CHIP TAN E CAP.	10μF	16V	M
C1323	NEE11CM-106RZ	CHIP TAN E CAP.	10μF	16V	M
C1330	NEE11CM-226RZ	CHIP TAN E CAP.	22μF	16V	M
C1336	NEA11CM-106RZ	CHIP AL E CAP.	10μF	16V	M
C1337	QFV41HJ-104M	TF CAP.	0.1μF	50V	J
C1340	QCS11HJ-330	C CAP.	33pF	50V	J
C1402	NEA11CM-106RZ	CHIP AL E CAP.	10μF	16V	M
C1403	NEA11CM-106RZ	CHIP AL E CAP.	10μF	16V	M
C1404	QAT3110-300A	TRIMMER CAP			
C1406	QEE51AK-336M	TAN. CAP.	33μF	10V	K
C1416	NEA11CM-106RZ	CHIP AL E CAP.	10μF	16V	M
C1501	NEA11CM-476RP	CHIP AL E CAP.	47μF	16V	M
C1507	NEA11CM-476RP	CHIP AL E CAP.	47μF	16V	M
C1511	NEE11CM-106RZ	CHIP TAN E CAP.	10μF	16V	M
C1512	NEE21CM-105RS	CHIP TAN E CAP.	1μF	16V	M
C1513	NEE21CM-105RS	CHIP TAN E CAP.	1μF	16V	M
C1514	NEE21CM-105RY	CHIP TAN E CAP.	1μF	16V	M
C1515	QETB1CM-477	E CAP.	470μF	16V	M
C1516	QET41VR-107	E CAP.	100μF	35V	R
C1517	QETA1AM-477	E CAP.	470μF	10V	M
C1603	NEE11VM-474RZ	CHIP TAN E CAP.	0.47μF	35V	M
C1604	NEE11CM-106RZ	CHIP TAN E CAP.	10μF	16V	M
C1607	NEE11CM-225RZ	CHIP TAN E CAP.	2.2μF	16V	M
C1608	NEA11CM-106RZ	CHIP AL E CAP.	10μF	16V	M
C1612	QEPA1HM-105M	BP E CAP.	1μF	50V	M
C1621	NEE11AM-336RU	CHIP TAN E CAP.	33μF	10V	M
C1622	NEE11AM-336RZ	CHIP TAN E CAP.	33μF	10V	M
C1623	NEE11CM-106RU	CHIP TAN E CAP.	10μF	16V	M
C1624	NEA11CM-106RZ	CHIP AL E CAP.	10μF	16V	M
C1625	NEE11CM-106RZ	CHIP TAN E CAP.	10μF	16V	M
C1628	NEE11CM-106RZ	CHIP TAN E CAP.	10μF	16V	M
C1630	NEA10JM-226RZ	CHIP AL E CAP.	22μF	6.3V	M
C1705	QCY41HK-102A	C CAP.	1000pF	50V	K
TRANSFORMER					
T1001	CE41090-00AY	REFLOW TRANS			
T1002	CE41089-00AY	REFLOW TRANS			
T1004	CE41121-A0AY	REFLOW TRANS			
T1005	CE41211-00AY	B. PASS TRANSF			
T1101	CE41120-00AY	REFLOW TRANS			
T1102	CE41120-00AY	REFLOW TRANS			
COIL					
L1001	CE41131-220Y	CHIP INDUCTOR			
L1502	CJ39509-024	HETER CHOKE			

SYMBOL NO.	PART NO.	PART NAME	REMARKS
DIODE			
D1002	MA151A-W	CHIP DIODE	
D1003	1SV69	VARICAP DIODE	
D1004	MA151A-X	CHIP DIODE	
D1006	MA151K-X	CHIP DIODE	
D1009	1S2473H	SI. DIODE	
D1010	1S2473H	SI. DIODE	
D1121	MA157-X	CHIP DIODE	
D1301	MA151WA-W	CHIP DIODE	
D1303	1SV68	VARICAP DIODE	
D1304	MA151WA-W	CHIP DIODE	
D1502	MA3120 (L-H) -W	CHIP ZENER DIODE	
D1601	MA151WA-W	CHIP DIODE	
D1602	MA151WA-X	CHIP DIODE	
D1603	MA151WK-W	CHIP DIODE	
D1604	MA151K-W	CHIP DIODE	
D1606	MA3120 (L-H) -W	CHIP ZENER DIODE	
D1610	MA151A-W	CHIP DIODE	
D1705	MA151K-W	CHIP DIODE	
TRANSISTOR			
Q1001	2SC2778 (B, C) -W	CHIP TRNSISTOR	
Q1002	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1003	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1004	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1007	2SC2404 (D) -X	CHIP TRANSISTOR	
Q1011	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1012	2SC2778 (B, C) -X	CHIP TRANSISTOR	
Q1013	2SB709 (P-R) -X	CHIP TRANSISTOR	
Q1015	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1016	2SD1030 (R) -W	CHIP TRANSISTOR	
Q1020	2SC2259	SI. TRANSISTOR	
Q1021	2SC2259	SI. TRANSISTOR	
Q1022	2SC2259	SI. TRANSISTOR	
Q1101	2SC2778 (B, C) -X	CHIP TRANSISTOR	
Q1102	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1103	2SC2778 (B, C) -X	CHIP TRANSISTOR	
Q1104	2SC2778 (B, C) -X	CHIP TRANSISTOR	
Q1201	2SC2778 (B, C) -W	SI. TRANSISTOR	
Q1202	2SC2778 (B, C) -W	SI. TRANSISTOR	
Q1301	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q1302	2SK94-X	CHIP F E T	SS, SK
Q1303	2SK94-W	CHIP F E T	SS, SK
Q1304	2SK94-X	CHIP F E T	SS, SK
Q1305	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1306	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1307	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1308	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1309	2SC2404 (D) -X	CHIP TRANSISTOR	
Q1501	2SB970 (Q-S) -X	CHIP TRANSISTOR	
Q1504	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1602	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1603	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1604	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q1605	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1606	2SC2778 (B, C) -X	CHIP TRANSISTOR	
Q1607	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q1608	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1609	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1610	2SC2778 (B, C) -W	CHIP TRANSISTOR	

SYMBOL NO.	PART NO.	PART NAME	REMARKS
TRANSISTOR			
Q1611	2SB709 (P-R) -X	CHIP TRANSISTOR	
Q1614	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1615	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1616	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q1620	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q1621	2SC2778 (B, C) -X	CHIP TRANSISTOR	
IC			
IC1001	CX20055	I. C.	SS, SK
IC1002	CX-7930A	I. C.	SS, SK
IC1201	UPC358G-W	I. C. (M)	
IC1301	CX23047B	I. C.	SS, SK
IC1302	MB7052	I. C. (M)	SS, SK
IC1303	CX20053	I. C.	SS, SK
IC1304	CX20151	I. C.	SS, SK
IC1305	CX23039	I. C.	SS, SK
IC1501	UPC4558G-W	I. C. (M)	
IC1502	UPC358G-W	I. C. (M)	
IC1602	UPC4558G-W	I. C. (M)	
IC1604	MN4053BS-X	I. C. (M)	SS, SK
IC1605	UPD74HC04G-X	I. C. (M)	
OTHERS			
⚠	CE41084-C0A	SW REGURATOR	
	CM32181-B01	SHIELD CASE-FF	
	CM32182-A01	SHIELD CASE-ER	
	CM32183-C01	SHIELD CASE-FF	
	SPSH2040M	MINI SCREW	(×2)
	CM43967-001	REG. SPACER	
	CM32185-A01	HEAT SINK	
	SPSH2040M	MINI SCREW	(×2)
	SPSP2608Z	SCREW	
⚠ CP1301	ICP-N15	IC PROTECTOR	
SC1301	CE41156	IRIS SOCKET	
SW1301	QSS1B23-C01	SLIDE SWITCH	
SW1601	QSS1A12-C02	SLIDE SWITCH	
X1002	CE40770-00B	17HMZ CRYSTAL	
X1301	CE41212-001	28.375MHZ X TAL	

2. CAW-A012A IMAGER BOARD

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SYMBOL NO.	PART NO.	PART NAME	REMARKS
CAPACITOR			
CA002	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
CA004	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
CA008	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
CA010	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
CA011	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
CA012	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
CA013	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
CA014	NEE21CM-105RY	CHIP TAN E CAP.	1μF 16V M
CA015	NEE21CM-105RY	CHIP TAN E CAP.	1μF 16V M
CA016	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
CA017	NEE21VM-105RS	CHIP TAN E CAP.	1μF 35V M
CA018	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
CA021	NEE21VM-105RY	CHIP TAN E CAP.	1μF 35V M
CA022	NEE21VM-105RY	CHIP TAN E CAP.	1μF 35V M
CA023	NEE21VM-105RY	CHIP TAN E CAP.	1μF 35V M
CA024	NEE21VM-105RY	CHIP TAN E CAP.	1μF 35V M
CA025	NEE11CM-106RZ	CHIP TAN E CAP.	10μF 16V M
CA026	NEE11CM-106RZ	CHIP TAN E CAP.	10μF 16V M
CA027	NEE11CM-106RZ	CHIP TAN E CAP.	10μF 16V M
CA031	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
CA032	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
CA033	NEE21VM-105RS	CHIP TAN E CAP.	1μF 35V M
CA034	NEE21CM-105RY	CHIP TAN E CAP.	1μF 16V M
CA035	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
CA036	QEKB1EM-106GM	E CAP.	10μF 25V M
CA037	NEE21CM-105RY	CHIP TAN E CAP.	1μF 16V M
CA041	NEE11EM-106RU	CHIP TAN E CAP.	10μF 25V M
DIODE			
DA001	MA151WA-W	CHIP DIODE	
DA002	MA151WA-W	CHIP DIODE	
DA003	MA151WA-X	CHIP DIODE	
DA004	MA151WA-X	CHIP DIODE	
DA005	MA157-X	CHIP DIODE	
DA006	MA151WA-X	CHIP DIODE	
DA007	MA151WA-X	CHIP DIODE	
DA008	MA3051-W	CHIP ZENER DIODE	
DA009	1S2473H	SI. DIODE	
TRANSISTOR			
QA001	2SC2778 (B, C) -X	CHIP TRANSISTOR	
QA002	2SC2778 (B, C) -X	CHIP TRANSISTOR	
QA003	2SC2778 (B, C) -X	CHIP TRANSISTOR	
QA004	2SC2778 (B, C) -X	CHIP TRANSISTOR	
QA005	2SC2404 (D) -X	CHIP TRANSISTOR	
IC			
ICA002	CX20180	I. C.	SS, SK
ICA003	CXB0026M	I. C.	SS, SK
ICA004	CXB0026M	I. C.	SS, SK
OTHERS			
	CE41122-010	IC SOCKET	(×2)
	CM32179-001	SHIELD CASE-IF	
	CM32180-A01	SHIELD CASE-IR	

3. CAW-4511A RGB & POWER BOARD

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SYMBOL NO.	PART NO.	PART NAME	REMARKS
VARIABLE R			
R4008	CE40624-222A	V R	2.2kΩ Y-R GAIN
R4009	CE40624-472A	V. R	4.7KΩ Y-R MAT.
R4018	CE40624-103A	V. R	10KΩ Y-B GAIN
R4019	CE40624-472A	V. R	4.7KΩ Y-B GAIN
R4029	CE40624-222A	V. R	2.2KΩ Y-G MAT.
R4046	CE40624-103A	V. R	10KΩ R SET UP
R4050	CE40624-103A	V. R	10KΩ B SET UP
R4054	CE40624-103A	V. R	10KΩ B SET UP
R4056	CE40624-102A	V. R	1KΩ R GAIN
R4057	CE40624-102A	V. R	1KΩ G GAIN
R4058	CE40624-102A	V. R	1KΩ B GAIN
CAPACITOR			
C4001	NEE21CM-105RS	CHIP TAN E CAP.	1μF 16V M
C4002	NEE21CM-105RY	CHIP TAN E CAP.	1μF 16V M
C4003	NEE21CM-105RY	CHIP TAN E CAP.	1μF 16V M
C4004	NEE21CM-105RY	CHIP TAN E CAP.	1μF 16V M
C4010	NEA11CM-106RZ	CHIP AL E CAP.	10μF 16V M
C4013	NEE11CM-106RZ	CHIP TAN E CAP.	10μF 16V M
C4014	QETB1CM-477	E CAP.	470μF 16V M
C4016	QETB1CM-477	E CAP.	470μF 16V M
TRANSFORMER			
T4001	CE41282-00AY	REFLOW TRANS	
T4002	CE41282-00AY	REFLOW TRANS	
COIL			
L4001	CE40344-121YL	CHIP INDUCTOR	
DIODE			
D4001	MA151K-X	CHIP DIODE	
D4002	W06A	SI. DIODE	
TRANSISTOR			
Q4001	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q4002	2SC2778 (B, C) -X	CHIP TRANSISTOR	
Q4003	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q4004	2SC2778 (B, C) -W	SI. TRANSISTOR	
Q4005	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q4006	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q4007	2SB709 (P-R) -X	CHIP TRANSISTOR	
Q4008	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q4009	2SC2778 (B, C) -X	CHIP TRANSISTOR	
Q4010	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q4011	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q4012	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q4013	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q4014	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q4015	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q4016	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q4017	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q4018	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q4023	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q4024	2SB709 (P-R) -X	CHIP TRANSISTOR	
Q4025	2SB709 (P-R) -X	CHIP TRANSISTOR	
Q4026	2SD1030 (R) -W	CHIP TRANSISTOR	
Q4027	2SD1030 (R) -X	CHIP TRANSISTOR	
Q4028	2SD1030 (R) -X	CHIP TRANSISTOR	
Q4029	2SD1030 (R) -W	CHIP TRANSISTOR	
Q4030	2SD1030 (R) -X	CHIP TRANSISTOR	

CAW-4511A RGB & POWER BOARD

SYMBOL NO.	PART NO.	PART NAME	REMARKS
IC			
IC4001	M51324P-X	I. C.	
OTHERS			
	CM44450-001	FUSE LABEL	
	CM44450-002	FUSE LABEL	
	A44594-002	FUSE CLIP	(×4)
⚠ F4001	QMF51E2-1R0S	FUSE	1. 0A
⚠ F4002	QMF51E2-R40S	FUSE	0. 4A

4. CAW-8511A GEN-LOCK BOARD

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SYMBOL NO.	PART NO.	PART NAME	REMARKS
VARIABLE R			
R8148	A76195-682	V R	6.8KΩ SC PHASE
R8151	A76195-223	V. R	22kΩ H PHASE
RESISTOR			
R8186	QRD161J-474	C R	470kΩ 1/6W J
R8190	QRD161J-224	C R	220kΩ 1/6W J
CAPACITOR			
C8101	NEE11VM-474RZ	CHIP TAN E CAP.	0.47μF 35V M
C8103	NEE11CM-106RZ	CHIP TAN E CAP.	10μF 16V M
C8105	NEE11VM-474RZ	CHIP TAN E CAP.	0.47μF 35V M
C8106	NEE11CM-106RZ	CHIP TAN E CAP.	10μF 16V M
C8107	NEE21CM-105RY	CHIP TAN E CAP.	1μF 16V M
C8116	QFP31HJ-182S	PP CAP.	1800pF 50V J
C8117	QFP31HJ-681S	PP CAP.	680pF 50V J
C8122	NEE11CM-225RU	CHIP TAN E CAP.	2.2μF 16V M
C8128	QEN51HM-225	BP E CAP.	2.2μF 50V M
C8129	NEE11CM-106RZ	CHIP TAN E CAP.	10μF 16V M
C8130	NEE11CM-106RZ	CHIP TAN E CAP.	10μF 16V M
COIL			
L8005	CE40344-220YL	CHIP INDUCTOR	22μH
L8101	CE40344-220YL	CHIP INDUCTOR	22μH
L8102	CE40344-820YL	CHIP INDUCTOR	82μH
L8103	CE40344-220YL	CHIP INDUCTOR	22μH
DIODE			
D8001	MA151WA-W	CHIP DIODE	
TRANSISTOR			
Q8101	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8102	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8103	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q8104	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q8105	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8106	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8107	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q8108	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8110	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8111	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8112	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8113	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8114	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8116	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8117	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8118	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8119	2SC2778 (B, C) -W	CHIP TRANSISTOR	
Q8120	2SB709 (P-R) -W	CHIP TRANSISTOR	
Q8121	2SB709 (P-R) -W	CHIP TRANSISTOR	
IC			
IC8001	TC4053BF-X	I. C. (M)	
IC8002	TC4538BF-X	I. C. (M)	
IC8003	MC14046BF-X	I. C. (H)	SS, SK
IC8004	AN610P	I. C.	
IC8005	UPC358G-W	I. C. (M)	
OTHERS			
SW8001	QSS4B23-C01	SLIDE SWITCH	